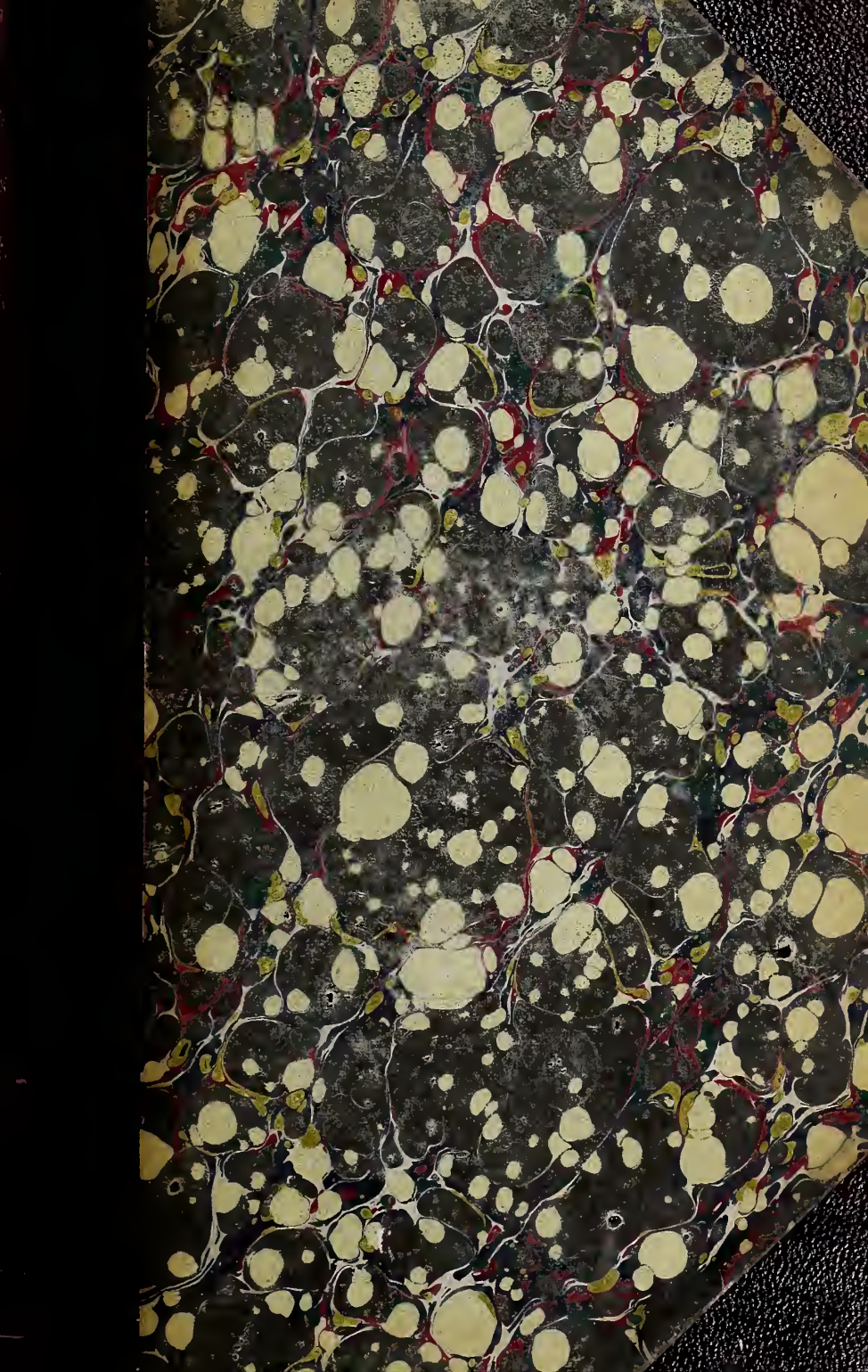

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I.—*Geological Sketch of the Neilgherries, (Níl-giri.) By Dr.* P. M. Benza, *Surgeon to the Honorable the Governor of Madras.*

[Read at the Meeting of the 5th instant.]

The group of hills, called the Neilgherries, may be considered as the southern termination of the Western Ghâts, which at this place end in abrupt, lofty, and almost vertical precipices; the extensive valley of Coimbatúr, dividing them from the Pálghât chain, which, in the same direction as the Ghâts, extends down to Cape Comorin.

The Neilgherries form an elevated plateau, projecting in an easterly direction, from the line of the ghâts, in the form of a triangle, the base of which is the continuation of the ghâts themselves,

They rise abruptly from the table-land of Mysore, in stupendous cliffs, with an elevation of many thousand feet. Two rivers encircle them, as it were, running round their base. The Bhowání river, rising in the western side of the Kúndas, and among all the hills of that group, runs in an easterly direction along the foot of the side of the Neilgherries, and, just below the apex of the triangle, is joined by the Moyar, which together with the Paykar, having their origin in the Noddimatty range precisely opposite the sources of the Bhowání, and making a sharp curve after leaving the hills, runs an easterly course, joining the Bhowání at Dánikncottah, and under that name, after running about 30 miles, they discharge their water into the Cavery.

The Neilgherries*, being the highest hills in the whole of the peninsula, south of the Himálaya, possess a greater degree of geological interest than any other group in this extensive region.

* "The Neilgherry Hills are situated between the parallels of 11° 10′ and 11° 32′ N. latitude, and 76° 59′ and 77° 31′ E. longitude from Greenwich; their greatest extent in an oblique direction, from S. W. to N. S. is from 38 to

Their being almost in the middle of a district, in which one of the most interesting rocks in the Indian formations (the laterite) is found developed in all its characteristic features, adds not a little to their importance in a geological point of view. On account of their superior elevation, they ought to be carefully examined by the geologist, before he extends his researches to the other parts of the chain, of which they form the most elevated point.

It was, undoubtedly, after consideration of this kind, that the late Doctor Turnbull Christie, of the Madras Medical Establishment, had begun his geological survey of the peninsula from the Neilgherries, as from a point where the rocks, found at a lower level, are seen in their original state, unmodified, and unaltered by formations and deposits, which events and revolutions, subsequent to the elevation of the whole chain of the western ghâts, must have produced; and had his life been spared, he would, undoubtedly, have given to the public the most accurate and comprehensive account of the geological formations of this interesting part of India, and would have settled many doubtful points in Indian geology, which now keep many of the ablest geologists in a state of uncertainty and suspense.

The few memoirs he published regarding the geology, not only of India, but of those places through which he journeyed, particularly of Sicily, show what was to be expected from a man, who evinced so much information and accuracy of observation on those subjects. Unfortunately for Indian geology, he was cut off at the very beginning of his labours on these very hills, which had in preference attracted his attention and researches.

We are told that the experienced eye of the geologist can easily guess the nature of the rock composing a hill or a system of hills, by the simple inspection of its outlines: thus, spiry peaks show the formation to be primitive; rounded smooth outlines are indicative of calcareous mountains; while the castellated ruin-like appearance of a mountain, is proper to the sandstone formation.

This criterion, however, would lead into error regarding the nature of the rocks forming the Neilgherries. Although their contour is even, smooth, rounded, and, as it were, undulating, the fundamental rocks of which they are composed belong to the primitive class.

Their outline resembles those hills and eminences we meet in districts, resulting from tertiary or alluvial deposits. What the rock

40 miles, and their extreme breadth 15; taking in account the great undulations of the surface, and the breadth above stated being pretty constant throughout, their superficial extent may be fairly estimated at from 6 to 700 square geographical miles.—*Baikie's Observations on the Neilgherries.*

is, which gives those hills the rounded form they exhibit, will be shown hereafter.

With the exception of some vertical cliffs and mural precipices, seen in the boundaries of this elevated plateau, and a few projecting masses of the fundamental rocks on the summits and declivities of these hills, the whole group is uniformly covered by a thick stratum of vegetable earth (No. 1*), which overlying a thicker stratum of red earth, (to be described in the sequel,) supports numerous plants, chiefly grasses, which, growing most luxuriantly in thick contiguous tufts, give the surface a smooth carpet-like appearance. This vegetable earth in general is clayey, and of a grey colour, and very friable. On this soil we occasionally see small rounded pieces of the decomposed subjacent rock, bestrewed particularly on those spots where blocks of the decomposing rock are seen jutting through the soil.

This vegetable soil is replaced in the low valleys and flats at the foot of the hills, by a black soil, such as we frequently see forming the peat-bog in swampy grounds, in which a large quantity of vegetable matter is decomposing (No. 2).

This soil is of a black, or deep brown, colour; of tenacious consistence, when moist; crumbling into powder, and often splitting into prismatic masses, when dry. At first sight, it resembles the black soil of the plains of India. From this last, however, it seems to differ greatly, in containing a large quantity of carbonaceous matter, and much oxide of iron.

To deprive this black soil of the greater portion of its humidity, I exposed it to a heat, sufficient to melt lead, and after having weighed a certain quantity of it, subjected it to an intense heat for an hour; after this, it had lost more than 25 per cent. of the original weight, and had changed into an ochrey red powder (No. 3), without undergoing any vitrification, as is the case with the black soil of the Deccan, (Voysey.) It would therefore appear, that the loss is owing to the oxidification and consequent volatilization of the carbonaceous matter.

This soil, although more frequently found in low situations, is often seen in a thick stratum on the declivities of the hills, such as on the slope of one of the Dodabetta group, facing the cantonment; on that of the Elk Hills, (S.) above South Downs; near the Kaití Pass, and in many other localities, where I have remarked about it, a most luxuriant vegetation of innumerable ferns, of which the roots are seen decaying into a black powder.

In many places below this black soil, and sometimes under the

* The figures refer to specimens deposited in the As. Soc. museum; the letters to the accompanying Map.—Ed.

vegetable earth, we see thick beds of a yellow ochraceous earth abounding with silica (No. 4). Indeed, in some places, as at Kotagherry, it resembles very much the yellow Venetian Tripoli, previous to undergoing preparation for the arts (No. 5). The geological position, however, of the two, differs very much—the Venetian Tripoli, which is brought there from Corfu, and from the neighbouring coasts of Epirus, is found (as I have had opportunities of ascertaining) in the sandstone formation, which alternates with the magnesian limestone*. The kind of Tripoli I met with on the Neilgherries, seems to be the result of the disintegration of a species of iron flint found in primitive formations; some of the specimens I collected, have a great resemblance to the Eisnkeissel of Werner (No. $5\frac{1}{2}$). Some varieties of the finest white Tripoli arise from the decomposition of silicious rocks, such as calcedony, in Corfu and in upper Italy; but in general, the Neilgherry specimen is not so silicious, and seems to contain a good deal of alumina and iron. It is in this yellow clay that we occasionally see some tubular bodies, formed by concentric layers of the same clay, round the numerous roots of plants that grow on the soil above (No. 6). But what attracted my attention most was, to see (at Kotagherry) those tubular bodies traversing the thick stratum of black earth, which overlies the yellow clay, without having a particle of it in their composition. As if the roots, by a kind of capillary attraction, sucked up through the black soil, without mixing with it, the particles of the yellow clay which, undisturbed by the vicinity of the black soil, arranged themselves concentrically to the root; and the latter decaying has left the cavity of the tube empty†.

* It seems to be an argillaceous iron ore, similar probably to the one at Ashburnham, used for the manufacture of Tripoli, and belonging to the Hastings sands.—See Fitton's *Geological Sketch of the vicinity of Hastings, page* 50.

† "Brogniart alludes to something similar to these tubular bodies, enclosing the roots of plants in sandy places, where the iron appears to aggregate the sand round the roots; and he concludes the paragraph by confessing his inability to assign the cause producing it 'et dans ces-çi la cause qui a accumulé l'oxide de fer à l'entour de la racine .... est encore difficile à assigner.—*Tabl. des Terr. qui composent la Surface du Globe, page* 56.'

My friend Mr. Malcolmson, Secretary of the Madras Medical Board, writes to me as follows: On the banks of many of the streams in the Deccan, the black soil is seen penetrated by tubular *incrustations*, resembling *kankar;* they are evidently formed round the roots of plants, the decay of which leaves a cavity which may sometimes be seen to divide and ramify. Some of those in the banks of the Kanar river, Kamptee, near Nagpore, are more than an inch in diameter.—B.

Sergeant Dean's Jumna collection exhibits many incrustations of calcareous and ochreous matter of a similar nature.—Ed.

Immediately below the vegetable soil, in almost all places, we find a stratum of detritus (in general not above a few inches thick), which is different in different localities, according to the nature of the rock on which it rests. Thus, it is ferruginous on those places where iron ores are found: quartzy and silicious above the thick veins of quartz, which intersect these rocks. But in general it is composed of small fragments, sometimes rounded, and sometimes angular, of the decomposed rock (of which we shall speak hereafter), being identical with that we see on the surface of the soil (No. 7).

The simple inspection of this detritus, overlying, and corresponding in position and nature to the subjacent rock, forces upon us the conclusion, that it does not belong to the alluvium (terrains de transport), but that it has its origin in the disintegration of the rock *in situ*, without any, or any material displacement from the rock which has given rise to it.

Another fact that proves this detritus to arise from the decomposition of the underlying rock, previous to its becoming lithomargic earth, and while in the dry friable state which seems to have preceded it, is, that the porcelain earth, wherever this last earth is found in large beds below the vegetable earth, is never overlaid with detritus; because the rock is all at once converted into porcelain earth, without the intermediate passage into the dry friable rock, from which the detritus arises.

This detritus is seen almost in all localities on these hills; the numerous sections that have been made in their declivities, for the new roads, show it clearly every where. On looking at the banks on the sides of those sections, we observe the detritus adapting itself to all the irregularities and zig-zags of the subjacent rock, or stratum. Fig. 2 of Pl. XXXI. shows this conformity better than any description. It is taken from the bank of the road round the lake near the bund.

That this detritus has not been transported from any distance is further proved, by observing it on the surface of the soil in those places where the protruding rocks are either decomposed or decomposing. We often see the still undecomposed nucleus of the rock protruding through the soil, surrounded and enveloped by the numerous concentric layers of the decomposed rock, the bassets of which we see level with the soil, the upper portion of them having been disintegrated into a detritus, which is scattered on the soil in the vicinity of the blocks. As far as I know, no organic remains have hitherto been found either in this detritus, or in the black soil.

In some places the detritus, for causes difficult to guess, assumes

a degree of hardness, and approaches a conglomerate; the small rounded pieces being agglutinated by a clayey paste, resembling a pudding-stone. This is particularly the case in those localities where it overlies the iron ores, so abundant on these hills. When the subjacent rock is the hematitic iron ore, the conglomerate resembles exactly the pisiform, or oolitic iron ore, and in some places it is hard enough to be used for architectural purposes. The conglomerate in this state of aggregation is similar to some varieties of laterite found in the plains of the Carnatic. But this pisiform iron ore is not to be confounded with another rock, which also resembles laterite, and is met on these hills in enormously thick beds, hereafter to be described.

Below the detritus, in almost all places on the hills, we find a thick stratum of an ochraceous red earth, which occasionally assumes both the appearance and the composition of lithomarge, and for this reason, I shall call it hereafter indiscriminately either lithomargic, or red earth. In some of the lower hills, this stratum is above 40 feet thick, as it is near the bund of the lake. It is this red earth, which, filling up the interstices among the original inequalities of the projecting rocks, has given the hills their rounded appearance, by smoothing all the asperities and irregularities of the original rock; or, to speak more correctly, the projecting points themselves have been smoothed down by their own decomposition into lithomargic earth.

In general, this red earth is of a mottled colour, or streaked with different hues of red, yellow, crimson, white, and grey or brown. It feels unctuous to the touch, and crumbles into dust when pressed between the fingers. It does not form a paste with water, but subsides to the bottom of the vessel. The different colours of this earth are separate and distinct, having a decided line of demarcation, so as to show that they are produced by the decomposition of separate and distinct minerals. We occasionally find in it thick veins of pure white felspar decomposed into porcelain earth, traversing it in all directions; precisely as we observe the same veins of felspar, in an undecomposed state, traversing the hard rock, which forms the hills.

This red lithomargic mould is evidently the result of the decomposition of two of the rocks, which almost exclusively form the Neilgherries; viz. the sienitic granite, and the hornblende rock, or primitive greenstone; of both which we shall speak hereafter.

It seems that before the rock is transformed into red earth, it passes into a dry friable substance, which sometimes has consistence enough to be cut and used for architectural purposes; many of the stones used in the construction of the Kúnúr bridge, are of this nature. The second stage of the decomposition is that, in which it

becomes of a soft consistence and earthy texture: the minerals composing the rock still retaining their relative position as before. Thus we see in the lithomargic earth, what was hornblende, changed into a red ochrey substance; the felspar into a white clay; the numerous garnets into a crimson-coloured clay; the quartz alone remaining unaltered and undisintegrated, which, after all, occurs but in a very scanty proportion in the rock (No. 12).

It is curious to observe, that the substance of the crystalline rock is not protected from decomposition by the thick layers of its own decomposed substance; and notwithstanding its being buried many feet beneath the surface of the soil, under a thick stratum of vegetable earth detritus and lithomargic earth, the decomposition appears to be going on without the concurrence of the atmospheric air.

In many places the entire block has undergone the process of decomposition, and in the sections for the roads, we occasionally see many concentric layers of the decomposed rock, like the coats of an onion when cut transversely. It is not rare to observe, that these coats have, in many localities, a kind of crust (*enduit*) of a black substance, probably oxide of iron (No. 13). The decomposition of the rocks takes place from outside inwardly, and appears to proceed, or to have proceeded gradually. It seems that the felspar and the hornblende are the first to be decomposed, the one (losing the alkaline matter? Sir H. Davy) becomes opaque and whitish; the other, by the hyperoxidation of its iron, is converted into an ochreous clayey substance: the garnets do not resist decomposition long; but the only change that the quartz seems to undergo is in its degree of compactness; becoming friable, and easily reduced into sand by the fingers.

If observations and facts were wanting to prove that this thick mass of lithomargic earth is owing to the decomposed granitic rock of these hills, the following is conclusive. The original undecomposed rock is, as I have said, traversed occasionally by thick veins of quartz. These veins resisting decomposition (which affects the remainder of the ingredients of the rock) are seen *in a continuous course, penetrating from the hard crystalline undecomposed nucleus of the rock into the lithomargic earth, and into the concentric layers of the already decomposed rock.* Therefore, it is impossible to avoid the conclusion, that the red earth and the rock were, at one time, *one mass, traversed by the quartz vein,* which is still seen *continuous* and entire, notwithstanding the transformation of one-half of the rock into red earth.

The appearance I have just described, is seen on the N. bank of the road, which descends from Ootacamund to Kaití valley, after the steepest descent of the Kaití pass is finished; and, I dare say,

may be found in many other places, which I have had no opportunity of visiting.

What I have said of the quartz veins is also applicable to the more numerous felspathic veins, which traverse the rock; with this difference, that they are decomposed, and converted into porcelain earth, while those of quartz are entire and unchanged. But the *continuity* of the vein is evident, although one-half of it has changed nature.

An additional, although negative, proof regarding the transformation of the granitic rock into lithomargic earth, is, that on those hills where no rocks containing hornblende are found, this earth is wanting. This is the case on the summits of Dodabetta, Elk Hill, Kaití pass, &c., in which places the protruding rock being either granite, or pegmatite, it exfoliates in laminæ like granite, instead of decomposing into red lithomargic earth.

It would be worth ascertaining, whether the crimson-coloured dots and streaks in the lithomargic earth be owing to the decomposition of the numerous garnets contained in the original rock. I have had opportunities, more than once, to remark, that in those localities where the sienitic granite abounds with garnets, the lithomargic earth, resulting from its decomposition, has the crimson coloured dots similar to those in the undecomposed rock (No. 14). I have made the same observation in the decomposed gneiss in the Northern Circars, where it abounds with this mineral.

A question naturally presents itself after the above remarks, regarding the decomposition of the granite, and hornblende rock of the Neilgherries. The same identical rocks are found in many parts of the Peninsula, particularly along the chain of the eastern ghâts; and yet their decomposition does not give rise to the same results. As I have visited but very few localities in India where these rocks prevail, I cannot positively say whether or not the result of their decomposition in both localities be the same*. But, this is certain, that the causes, which may have contributed to decomposition in one place, do not exist in the other: of that class are cold, damp, frost, elevation, &c., which are not found in the low lands. Besides, is this decomposition the effect of *existing causes*, or the consequence of *time* and *revolutions* gone by?

Here I must remark, that in some localities, such as near the bund of the lake, on the road below the church, above the bazar, &c. the red earth assumes the composition, texture, and appearance of real lithomarge.

* Doctor Heyne says, "a red soil prevails where sienite forms the apparent ground rock."—*Tracts Historical and Statistical on India, page* 349.

As I have proposed to abstain from speculations, and from far-fetched theories, I shall not enter into any hypothesis respecting the causes of this decomposition. It is enough to have noted a geological fact, which requires but simple inspection to be certain of its existence. I shall therefore proceed to describe some minerals, which are found imbedded in the red earth; some of which might prove very useful and advantageous in the arts. Such is the porcelain earth, found in enormous beds, and of the greatest purity, in this locality.

This mineral is evidently derived (as it is almost in all places where it is found in Europe) from the decomposition of the pegmatite or graphic granite, which is chiefly met with in primitive districts. As this rock does not appear to be common on the Neilgherries, I found it difficult, at first, to account for the origin of the numerous and thick beds of porcelain clay. It was after visiting and examining the summits of some of the highest hills, that I found a variety of pegmatite forming many of the most prominent rocks on them. Such are the summits of Dodabetta, Elk Hill, Kaití pass, some of the peaks of the Kúndas, and probably many other places which I did not visit.

It is undoubtedly to some of the erratic blocks and rolled masses of this rock, or to the decomposition of those beds of pegmatite, into which the true granite of the high hills seems to pass, that the porcelain earth is owing. Of these blocks, still in an undecomposed state, we see many in the valley of Kaití derived, in all probability, from the summit of Dodabetta, or from that of the rock of Kaití, where the pegmatite is seen *in situ*.

By comparing a piece of this porcelain earth, just taken out of the bed, with a piece of the hard pegmatite rock, one cannot but be convinced of their being the same rock; the one in a hard, the others, in a decomposed state. (No. 15.) The pieces of the crystalline smoky quartz (which is the only other mineral entering in the composition of the pegmatite, besides felspar) are still visible in the same situation, as when the rock had not undergone decomposition, having become more brittle, and easy of disintegration.

The porcelain earth is not to be confounded with that which results from the decomposition of the pure felspar veins, so frequently seen in the sienitic granite. By simply looking at both specimens, the difference is discovered (No. 16). The latter has no sandy particles in its composition, such as are found in the other, which by such addition is better adapted for the manufacture of pottery, in which silicious sand is a necessary ingredient.

I speak with some hesitation regarding a mineral I found only in one place on the Neilgherries, and I am doubtful whether it exists in

any quantity in those hills. It is a brown ferruginous clay, very closely resembling amber, particularly that kind which is exported from the Island of Cyprus (No. 17). I found it between two large blocks of decomposing sienitic granite, or rather hornblende rock, with garnets, close to the bund of the lake.

The next rocks to be described are two metallic ores, in all probability, originally imbedded, as veins, in the rock: which last being now decomposed, they are left imbedded in the lithomargic earth: indeed, one of these ores is still seen as a vein, in the undecomposed rock.

The first is the magnetic iron ore, so common in many parts of India, and which, besides the metal, contains variable proportions of quartz (No. 18). The places where I have met with this iron ore are marked in the map: in some of them the ore is imbedded in the lithomargic earth, while in others it is like a vein in the rock. I saw it in this last position in the road descending to Kaití valley, where the metal is very little in quantity, compared with the granular quartz, which in some parts of the vein predominates to the almost entire exclusion of the metal (No. 19).

The two places on the Neilgherries, where I have seen this ore very rich in metal, are, one near the village of Vartsigiri (Vrotagherry), and the other close to, and traversing, the Lake of Ootacamund in two places. The specimen from Vartsigiri (No. 20) is very compact and rich in metal. I took it from a large block, probably the outgoings of a thick bed at the southern extremity of the valley, at the other end of which the village stands.

Generally speaking, the quartz is lamellar, very rarely granular, and it seems to alternate with the metal in parallel laminæ. The appearance, composition, and proportion of the ingredients of this magnetic iron ore are very different in different places; nay, in the same vein. For instance, the vein seen just below the building called Gradation Hall, between the road, and the margin of the lake, in its N. E. extremity, has a compact, metallic structure, highly magnetic, with hardly any quartz (No. 21): a few yards to the south-west, the vein contains a good deal of quartz; the metal is more oxidated, although maintaining still its magnetic powers (No. 22). Following the vein in the same direction, we see it appear in the opposite side of the lake, in the banks of the road, which goes round and close to the lake. There the ore has lost a good deal of its quartz; the iron is more oxidated, and the rock assumes a kind of columnar structure (No. 23). This is the appearance of the vein in the section for the road. But the out-croppings of the vein at the

top of the same hillock are compact, scabrous, and of a slight cellular texture (No. 24). Going on always S. W., we see the same vein continued over the next hill, close to the road going to the Kundas; and so much divested of iron, that it resembles a friable stratified sandstone, the quartz being granular (No. 25).

It is in this kind of magnetic iron ore, particularly in the blocks below Gradation Hall, that I remarked on the quartz laminæ, small brilliant, gold-coloured specks, precisely similar to those seen in the auriferous quartz veins in the rocks of the Malabar coasts, specimens of which have been deposited by my friend Colonel CULLEN in your museum. Does this appearance indicate the existence of particles of gold in this ore? We know that in America, gold is occasionally found in the siderocriste, which is a species of quartz iron ore, like the one just described*.

It is the belief of some people, that owing to the similarity of the rocks, of the detritus, and of the quartz veins, of the Malabar coast, and of these hills, gold may be found in this last, as well as in the former. The specimen of the earth I send is taken (No. 26) from an excavation made, some years ago, by an officer, who had been employed on the Malabar coast, for the purpose of ascertaining the existence of gold in the detritus of that coast. It is said that he found gold in the earth dug up on the side of one of the hills of the Dodabetta group, facing the cantonment†.

Before concluding my observations regarding this magnetic iron ore, I must repeat what I said in the beginning; that it is found in thick beds, evidently imbedded either in the original rock, or, which comes to the same thing, in the lithomargic earth, the result of its decomposition.

Iron ores are so common on these hills, independently of the oxides of that metal contained in the minerals forming the rock, that many springs of water are of the chalybeate class‡.

* The specimen of Colonel CULLEN is marked "auriferous quartz, stratified: Nelli Allum, Malabar." The same gentleman sent to your museum another specimen, which he calls "auriferous micaschist," which contains the same kind of shining, gold-coloured specks.

† The sand which results from the desintegration of this species of iron ore is very nearly similar to what is called titaniferous sand.—Does any menaccanite exist in this sand? The rock in which this ore is contained, appears to be similar to that which is seen in Cornwall, from which the sand containing that new mineral is derived. Professor SEDGWICK informs Mr. DE LA BECHE, that the menaccanite of Cornwall is derived from the *decomposition* of a *hornblende rock*, composed of hornblende and felspar.—*Geological Manual.*

‡ BAIKIE'S Observations on the Neilgherries, page 14.

The next species of iron ore on the Neilgherries is the hæmatitic, forming immense heds, and sometimes whole hillocks, among the hornblende rocks, and sienitic granite. In all the places where it is found, large blocks of this ore are seen projecting through the soil, having a scabrous, cellular, and sometimes cavernous appearance at the surface.

As this rock resembles very much the laterite of this part of India, I shall be more particular in describing its geological position and association, in order that it might be seen whether it ought to be classed with the laterite of the low lands, or among the iron ores found in many other parts, associated and in veins, in primitive districts.

Before entering into the description of this rock, I must remark, once for all, that the position and association of the rocks on the Neilgherries is not so easily ascertained, and clearly seen, as in other localities of India, on account of the enormously thick stratum of red earth and vegetable soil, which cover uniformly the whole plateau. So that we are often reduced to the necessity of judging of the nature of the rock composing the hills, by the few projecting masses at the top, or on its declivities.

It is for this reason, that I am unable to say positively whether the rock I am going to describe be overlying, or one of those metalic veins which traverse the original rock; although I have more than one reason to surmise, that the last is the position of this ferruginous ore on the Neilgherries.

All I have been able to ascertain regarding this ore, may be detailed by describing one or two of the localities, where this formation is seen developed in a more marked manner than any where else on the Neilgherries.

The most extensive formation of this hæmalitic iron ore is seen on both sides of what I shall call Scotland Valley*. It is the valley through which the superfluous waters from the lake discharge themselves into the Moyar river. This valley runs nearly E. and W. above two hundred yards below the bund of the lake; close to the left hank of the stream, we see a large block of compact iron ore jutting through the soil (No. 27). Proceeding westward along the right bank of the torrent, for about a quarter of a mile, we come to a place where the stream is joined by another flowing from the S. W. On both sides of this river (until we come to this junction), the projecting rocks,

* Sir Frederick Adam, our present Governor, while on the hills, used to call it by that name, on account of a resemblance he saw in it to some place in Scotland.

which in some places make up knolls and hillocks, are of the usual sienitic granite, with a good deal of hornblende and a few garnets.

On fording the river, at the place of junction, we see on the opposite bank all the projecting rocks to have totally changed their character; they are now cellular, hæmatitic iron ore, rich in metal (No. 28). That rock is seen protruding through the soil of this and of the next hill (W). Some of the enclosures for cattle on the declivities of this hill are constructed with large masses of the cellular iron ore, which however in some of them has a very compact structure (No. 29).

The highest of the two hills appears to be entirely formed of this rock, of which huge masses are seen in the intervening ravine. On the summit of the highest hill, the rock assumes a pudding-stone-like structure, being a hard conglomerate of numerous rounded pieces of ferruginous clay iron ore, strongly agglutinated together by a clayey cement (No. 30). A prodigious number of these rounded pebbles are scattered about, covering nearly the whole of the summit of the hill (No. 31). Many of the hard blocks of this conglomerate resemble very much (if they are not identical with) the laterite of the low lands of India.

Descending from the summit, along the western declivity of the hill (facing Pinnapal Hill), and only a few yards from the top, the rock insensibly changes its appearance and structure. It becomes by degrees more compact, and loses its cellular structure; in short, it assumes the compact appearance of common hæmatitic iron ore (No. 32), very rich in iron; and in this state it continues to the foot of the hill on that side, where some of the projecting masses of this iron ore are flanked by others of sienitic granite, or rather hornblende rock.

These two hills, on the N. E. side, and at their foot, close to the stream, are skirted by immense masses of sienitic granite, through which the waters of the river are heard roaring; except at one place, at the foot of the high hill, where the river is forded to go towards the new road from Nandiwatam to Ootacamund. In that place the iron ore bed crosses the stream; forms numerous projecting masses on the slope of the opposite hill, having a N. E. direction; crosses the road of Nandiwatam, and terminates in the summit of the hillock to the N. E. of the road; beyond the latter place, this rock cannot be traced.

Now this filon of iron ore, after crossing the stream of Scotland Valley, is *evidently* and *clearly* seen *flanked* on *both sides* by sienitic granite, jutting in large blocks through the soil, in the very same way

as the masses of the iron ore shoot up; and therefore, it is fair to conclude, that the last do not overlie the former.

I must here call the attention of the reader to the almost imperceptible transition of the cavernous tubular kind of ferruginous conglomerate, into the uniformly compact hæmatitic iron ore of this hill: an appearance that I had an opportunity of observing also in the Northern Circars at Pandagaram, near Samalkátah, where the compact, slaty hæmatitic iron ore is seen passing into a conglomerate very much like laterite (Nos. 33 and 34).

Another view of the hæmatitic ore is obtained below the bluff rocks of the summit of Dodabetta, beyond the villages of Mantú, close to the road, which descends from the hollow between Kaití rock and Dodabetta. Coming towards Ootacamund, we see huge masses of ore protruding through the soil (No. 35). It is scabrous and cellular, but not perforated by tubular sinuosities like the laterite. It is similar to some of the masses of the same ore on the declivities of the hills of Scotland Valley. This vein has but a few yards' thickness, having a N. and S. direction. On both sides of, and nearly in contact with the blocks of ore are seen masses of sienitic porphyry, or rather hornblende porphyry, containing some garnets (No. 36), which, as we proceed towards the villages of Mantú, lose the garnets, and become hornblende rock (No. 37).

The two hillocks S. E., and close to the lake, and on which Cluny and South Down houses are built, are chiefly composed of the same iron ore. The sections in these declivities, on account of the road which goes round the lake, show the ore decomposed into a red clayey earth, imbedded in the lithomargic earth, resulting, as we have seen, from the decomposition of the original sienitic rock.

The same ore is seen near the summit of Dodabetta, on the hill before descending into the Elephant Valley, and in other localities, which it would be superfluous to describe, after having detailed the principal features of those places where it most abounds. I must, however, here recall to the memory of the reader what I have said, speaking of the detritus below the vegetable earth. It is in the localities, which abound with this iron ore, that the detritus is composed of ferruginous rounded pebbles, occasionally cemented together into a hard conglomerate, like oolitic iron ore, by a clayey paste.

The hæmatitic iron ore seems to contain some felspar, which in this rock is decomposed into a yellowish clay, lining some of the cavities in the rock: but I never found any quartz in it.

Before concluding these details regarding this iron ore, I will point out some particularities, in which (notwithstanding its similarity in

appearance) it seems to differ from the laterite of the other parts of India, that I have had an opportunity of examining. The rock of the Neilgherries is by no means so cavernous, and has not so many tubular sinuosities as the laterite of the Carnatic, Northern Circars, &c.; it seems also to be richer in metal, and, what appears to constitute a marked difference, it is entirely divested of any quartz, or sandy particles, which abound so much in the laterite of other places. Besides, we are told by Doctor Heyne, that in the laterite of the Red Hills, Nellore, &c. a marl or carbonate of lime is occasionally one of the ingredients; no traces of this carbonate are found in the stone of the Neilgherries*.

That this rock of the Neilgherries is to be classed with hæmatitic iron ore, rather than with the true Indian laterite (an overlying rock), is very probable, considering that rocks similar in appearance to it are found in Europe, while the last is peculiar to India†.

It is said of the Indian laterite, that it is associated occasionally with trap. On the Neilgherries, basaltic dykes are not rare, yet I never saw what Voysey remarked in other parts of India, viz. the passage of basalt into wacke, and into iron clay, (by this last name, meaning laterite;) another additional difference between the two rocks.

Hitherto no organic remains have been found in this rock on the Neilgherries, which appears also to have been the case with the laterite of the other parts of the peninsula.

I am not positive regarding the existence of manganese on these hills: my friend Colonel Cullen says, that it is found mixed in the iron ore near the lake; and I found a straggling piece of this ore in the valley of Kaití (No. 38), which I have not analysed, but which has all the external characters of one.

The lowest visible rock of the Neilgherries is of the primitive unstratified class, including true granite, pegmatite, sienitic granite, and hornblende rock: sienitic gneiss, and hornblende slate are occasionally seen, but they belong more to the outskirts of the hills than to the group itself. Besides these rocks, we find granitelle, and a rock composed of four minerals, felspar, hornblende, garnets, and quartz.

True granite, composed of felspar, quartz and mica, is not of rare occurrence; it frequently occupies the summits of the highest hills: thus it is seen in some of the Kúndá range, and of the Dodabetta group;

* Tracts.

† If my memory serves me right, I think I saw in your museum a specimen marked "black, brown, solid and perforated iron ore, from Poetz in Upper Lusatia," which appears to me similar to the Neilgherries hæmatitic, cavernous iron ore.

‡ No. 38 is decidedly an ore of manganese.—Ed.

I never saw it, except in the form of erratic blocks, in the low valleys (No. 39). In those places it has the usual appearance of immense masses split both by vertical and by horizontal fissures, into columnar or prismatic figures; they, however, no where assume the tor-like appearance so common in the granitic hills in other parts of India. The granite occasionally is of a dull, yellowish brown colour, owing to the felspar, which assumes that tint, resembling in that state the *feuille morte* of the French. Doctor Hardy has remarked the same change of colour in the granite of Mewar.

The other species of granite, found always associated with the former, is the pegmatite (No. 40), a rock composed of only two minerals, felspar and quartz. The places where I have found this rock *in situ* are marked in the map: it is a variety of the graphic granite; in aspect very different from the same rock found in other parts of Southern India, in which the quartz is regularly crystallized, and the felspar in long slender crystals, of a pale flesh colour.

In the variety of this rock on the Neilgherries, the felspar is milk-white, lamellar; but not in regular prismatic crystals: the quartz is occasionally of a smoky colour or bluish; and in angular pieces, this colour is sometimes so deep as to appear nearly black. In some of the masses are occasionally seen a few garnets, or a little hornblende; but in general, the rock is exclusively composed of the two minerals, felspar and quartz*.

Of this rock some erratic blocks are seen in the valleys, at the foot of those hills, the summits of which contain it *in situ*: this is the case in the Kaití valley, whither many of these boulders have been probably hurled down either from the summit of Dodabetta, or from the Kaití peak, where pegmatite is found.

It is undoubtedly from the decomposition of these masses, that the porcelain earth described in the beginning of this sketch, arises. By comparing the specimens of the one with those of the other, the identity of the two is established.

The sienitic granite varies in the proportion of its component minerals, and therefore in appearance; sometimes approaching diabase (primitive greenstone), and at others, granite (No. 41½). It almost always contains garnets as one of the minerals composing it; and when this mineral is abundant in the rock, the quartz diminishes in proportion. In the Dodabetta group, I have remarked in some

* This species of granite seems to be very common in many parts of India,—Dr. Hardy appears to describe it in many localities, in his sketch of the Geology of Central India. Many of the blocks jutting up in the plain between Palaveram and Madras, such as that near the Race Course, are all pegmatite.

places the garnets, instead of being either amorphous, or in angular crystallized pieces, assume the granular form, resembling colophonite; in which case, the rock containing it assumes a stratified appearance (No. 41).

The colophonite is composed of granular garnets, greenish hornblende, a little felspar, and less quartz. I have seen in your museum a specimen sent by Strūve from Norway, very much like the specimen I now send. The geological position of this rock, which I have found in one or two localities only, is the following. It is to be seen clearly in the ravine just above the high road going to Kúnúr, and close to the public bungalow of Kaití. Two huge masses of a black-looking unstratified rock are seen overlying three strata of a different rock. The upper and unstratified mass is a hornblende porphyry, which passes into sienitic granite. It is very nearly similar to the rock of the same composition I have mentioned as flanking the hæmatitic iron ore, behind Mantu village (No. 42). I have found precisely the same rock overlying the sienitic porphyry of the Garabunda pass, in the Northern Circars. Its hornblende is shining and lamellar, and is the most abundant of the component minerals; the garnets appear to be surrounded by a white powdery opaque felspar, they themselves half decomposed. Below this half-rounded mass is a stratum of a felspar rock, with a very little quartz and hornblende decomposing (No. 43). The thickness of this stratum, which is uniform, does not exceed a few inches; another, but thicker stratum of a granitic rock, lies under, and conformable to the above, being composed of reddish felspar, some garnets, little quartz, and mica; the passage from one rock to the other is sudden, decided, and well marked. Under this, and conformable to it, is a stratum of a rock almost entirely composed of hornblende and granular garnets: this is the lowest of the rocks seen; it becomes harder as it descends, when it assumes the appearance of colophonitic hornblende rock.

This lower rock appears stratified, and besides the seams of stratification, it has some fissures, perpendicular to them; so dividing the stone into prismatic portions. On account of the thick stratum of soil at the foot of the rock, I could not ascertain whether the last-mentioned was the lowermost rock. I must here remark, that the appearance of the two rocks immediately under the hornblende porphyry was that of a decomposing stone, as if from the action of fire.

The rock which prevails in the Kaití range, as well as in other places, is the one which abounds both with hornblende and amorphous garnets. These last sometimes are of a large size, and not

dispersed through the rock, but, as it were, in nests (No. 44). This rock is very like the specimen in your museum from Norway, marked "large garnets in hornblende." Indeed, I think that there is great analogy between the *sienite zirconienne* of Norway and this rock of the Neilgherries (No. 45). I remarked in one place of the Dodabetta group some veins containing quartz and garnets; the last in the granular or resinitic form (No. 46).

Before dismissing the subject of the hornblende rock, I must remark, that although this primitive greenstone is occasionally seen on the summit of some hills, in general it occupies the declivities or the lowest parts of them; and it often assumes a brilliant, laminar crystallization, being then exclusively formed of hornblende (No. 47).

I have seen it passing into hornblende slate at the foot of the Neilgherries, at the bottom of the Kúnúr pass. Here its strata dip to the east, and I am informed, that the same stratified rock is found at the foot of the same group of hills, to the west, the strata in that place dipping west. It is in those places that this rock occasionally passes into sienitic gneiss.

These are all the rocks I have met on the Neilgherries, of which their extensive plateau is formed, and the relative position of which can often only be surmised, on account of the thick covering of soil, and of red earth, which conceals the rock generally.

I must in the last place notice the numerous basaltic dykes which burst up through all these rocks indiscriminately, without however overlying them, except in one situation; and even there the basalt only forms a small ridge, flanked by the fundamental rock.

I shall describe briefly those places where I have had opportunity of examining this rock; and first, that in the Kúnúr pass. Not more than a mile from the bridge down the pass, and just below the village of Kúnúr, in the road, many of the blocks which have been blasted, are traversed by a dyke of basalt. In the little ravine close to the road, the dyke is seen *in situ* through the masses of granite in the jungle. This dyke divides in two or three branches, inclosing betwixt them the granite; then it is seen continuing in a north direction, till close to the huts of the village. The projecting masses through the soil indicate the direction of the thick dyke, which in a place near the road is divided in well marked prisms above the granite (No. 48).

This basalt is very compact; has a dull, even fracture; but in one portion of the dyke, I had the opportunity of observing, that the part which was in contact with the granite had the appearance of a crystalline hornblende, which passed into compact hard basalt towards the centre of the dyke. I also remarked, that where the dyke

was in contact with the granite, the basalt was projecting in a small ridge, which was divided into small prisms, as if the consequence of sudden refrigeration, and subsequent contraction (No. 49). The masses under the village, exfoliate into concentric laminæ, in which are some needle-shaped shining crystals, probably of augite (No. 50).

Another enormous dyke of this rock is seen in the chain of hills which connects Dodabetta with Kaití pass. The summit of the hill, which is between those two mountains, is formed of basalt in huge masses, some of which affect the prismatic figure. In general the large blocks are not so compact as the thin ramifications of the dyke traversing the rock, but the hornblende in the former is nearly granular and shining, somewhat approaching primary greenstone.

On the eastern and western *slopes* of this little ridge, the rock, of which the hill seems formed, is seen in huge projecting masses, so that the basalt does not appear to overlie the rock, but to have burst through it, vertically, in the centre of the ridge.

Going along the ridge from N. to S. after passing a little hollow, we ascend the hill, the summit of which is basaltic. The first intimation we have of the existence of this rock, is seeing many of the blocks of pegmatite traversed in all directions by a reticulated infiltration of basaltic matter (No. 51). On looking at the surface of the blocks level with the soil, we see it divided in irregular portions by the ramifications of the dyke.

Examining some of these masses, we see evidently that, in many of them, the thickness of the dyke diminishes as it proceeds upwardly, and therefore showing the injection of the basalt to have taken place from below. The following appearance exhibited by one of the blocks, shows clearly this direction of the basalt. It is a large mass of pegmatite exfoliating in thick laminæ. Portions of one of these had been removed, either by disintegration or otherwise; the remainder (perhaps a foot thick,) was still overlying the nucleus of the rock, which was nearly level with the soil. A basaltic dyke, an inch thick, was observed in the nucleus of the rock, which had been denuded of a portion of the laminæ; but this dyke did not penetrate into the upper remaining portion of the laminæ, which was incumbent on it. This dyke continued evidently under the remaining portion of this laminæ in the nucleus of the rock.

Going from Ootacamund towards Nundiwatum, along the new road, after about three miles, we meet with two basaltic dykes close to the road.

The first is seen near a small stream, like a ledge projecting at an

angle with the horizon, and the basset of which is hardly a foot above the soil. Its dip is west; its direction nearly N. and S.; and it is seen continued along the declivity of the hill for some hundred yards. It is traversed by fissures in different directions, giving the pieces a prismatic appearance. Proceeding N. we see in the next hill another and thicker dyke, with precisely the same direction as the former.

The basalt in this place traverses sienitic granite, and it is seen clearly on the side of the road. The pieces of all shapes, as prisms, cubes, rhombs, are strewed below the newly cut road. Above the road, the projecting masses of sienitic granite are traversed by innumerable ramifications of the dyke, enclosing between them pieces and masses of the fundamental rock (No. 52).

The same observation made when speaking of the Kaití dyke, is also applicable to this: the small basaltic veins have a compact, and dull texture, while the body of the dyke itself has a granular-like structure, and somewhat shining (No. 53).

In some of the Kúnda mountains, as that of the Avaláche, I also noticed some of these basaltic dykes; and judging from the numerous rounded blocks and pieces of basalt seen in the bed, and in the banks of the river, which descends from the hills N. of the Avaláche, basalt must be very common in that group.

Basaltic dykes are not rare in those places, which I have had an opportunity of visiting in the plains of India. I have seen them through granite and gneiss in Mysore; through porphyry, near the erratic hill of Adamanacotta; through hornblende slate, near Mottipollium; through porphyry, near Garabunda (Northern Circars), and in many other places. Are these dykes the fissures through which the enormous mass of trap, overlying most of the rocks of the peninsula, burst up? and which, subsequent events and revolutions having removed, the vents only through which it was forced up remain to be seen?

It is a well-ascertained fact that the structure, if not the nature, of rocks in contact with the basaltic dykes, is often greatly changed or modified. I saw nothing of this alteration in the rocks close to the dykes I have been describing. The specimen I send, shews no other change, except a slight diminution of cohesion among the composing minerals, and that not in a very marked manner, nor in every locality.

The above described are the rocks I had an opportunity of examining on the Neilgherries, having met none of the secondary, and much less of the tertiary class. It would appear from this, that the elevation of this plateau, and probably of the whole chain of the western

ghats of which the Neilgherries are the southern termination, happened at a period long anterior to the existence of life on our planet.

It is for this reason that I think Humboldt's opinion not supported by facts, when he says, " the chain of the Ural, the Baloor tâg, the ghats of the Malabar Coast, and the Vringckan are probably more modern than the " Chains of the Himalaya, and the Teenckan*. We know, that in the Himalaya, at several thousand feet elevation, and on the declivities of the highest ridges themselves, organic remains have been found in limestone, which seems of the age of the carboniferous group.

The nummulitic limestone of Chira Punjí, and the conglomerate rock, which forms the Deria Dún at the foot of the Himálaya, appear to assimilate those mountains to the Alps†. Therefore the Himalaya must have been heaved up at a period posterior to that when the Western ghats were elevated: these last containing not a trace of organic remains in the rocks which form them, while the former abound in them.

Elie de Beaumont admits the greater antiquity of the Malabar ghats over the Himalaya chain; but he conjectures, by the direction of the ghats being parallel to the Pyrenese-Appenin system, that they may probably belong to his sixth revolution of the surface of the globe. The passage, in which he expresses this perplexity, is worth transcribing, to show of what importance it is to establish the association, and the geological position of the laterite.

" Vouloir suivre ce système jusque dans l' Inde paraitrait peut-être abuser de la faculté des rapprochemens: cependant je crois devoir faire remarquer que la chaine des gâtes sur la côte du Malabar semble se cohordonner à la direction, dont je m' occupe. La grande faille, à laquelle parait dû l'escarpement occidental des gâtes, en élevant le plateau du pays des Maharattes, du Deccan, du Carnatic a élevé du même tems, le grand depôt argille-ferrugineux de laterite, qui forme les points plus élévés de ce plateau, ainsi que le montre la coupe des gâtes donnée par M. Christie. Il est à regretter que ce depôt de laterite, qui couvre dans l' Inde de si vastes étendues, n'aie, jusqu'a present, offert aucun fossile, et ne puisse être rapporté avec certitude à aucun étage geologique déterminé: mais on peut toujours remarquer que

* Edinburgh Philosophical Journal, October to January, 1832, Humboldt on the Mountain Chains—Volcanos of Central Asia.

† A writer in the Bulletin des Sciences Naturelles, concludes that the Dehra Dun is analogous in formation to the Molasse of the Alps; and Doctor Falconer is of the same opinion.—De la Beche, *Geological Manual.*

tant qu'on n' aura pas indiqué d' autre chaine* qui produisse sur la laterite l'effet mentionné cidessus, tout conduit à voir dans les gâtes la chaine la plus récente de la presqu'île occidentale de l' Inde, dont elle est en meme tems le trait geometrique le plus prononcé!"

Then he says in a note, that the Himálaya are more recent than the ghats, and the Andes more recent than the Allaghanys of America.

We see, by what Beaumont says, that he suspects the laterite to be the equivalent of those rocks deposited during the period that intervened between the deposition of the chalk, and the tertiary beds. But fossil remains being the only sure guide in determining the ages of these formations, and none hitherto having been found in the laterite, the question must still remain *sub judice*. Besides, we must remark here *en passant*, that the rocks of that epoch in Europe are all stratified, which is not the case with the laterite.

Before concluding this sketch of the geology of the Neilgherries, we must not pass unnoticed the fact of the absence of all sorts of calcareous formation. Even the widely spread kankar is not met with on the Neilgherries, although we find this travertinic deposit at the very foot of those hills, near Mútúpolium (No. 54).

The total absence of stratified rocks, and of calcareous formations, in this group, seems an additional proof of the remote period of its elevation. The only stratified rock, which appears to have been deposited near the place, through which this plateau was heaved up, is the hornblende slate, which is seen both on the east and on the west sides of the hills, being highly inclined, and having an opposite dip: the group serving as the centre of this anticlinal line.

On looking at the map, we see how the numerous valleys and ravines have a different, and often an opposite, direction. Except three or four of them, which diverge in opposite directions from a central point (Dodabetta), the others are so irregular, that it is impossible to refer them to one and the same cause. They certainly do not belong to the class of valleys of denudation, much less to that of corrosion by the streams: the volume of their waters being so very insignificant and divested of pebbly or sandy detritus, which so much hastens the corrosion of the rock, through which the rivers pass. They probably are the original consequence of the elevating force, which either irre-

* "With regard to this part of this passage, to show that there are other chains, having different direction from the Malabar ghats, on the summits of which we see the laterite as an overlying rock, we may quote some of the branches of the Vindiya range, where the laterite overlays either basalt or sandstone; and also many sandstone hills on the Northern Circars: and yet the Vindiya Chain has a different direction from the Malabar ghats.

gularly applied to the different points of the area, or the mass itself, yielding irregularly in the different situations, gave rise to the inequality of the whole surface of these hills.

To conclude, therefore, it seems that the granitic rocks, which occupy the highest hills of this group, forced their way, and were heaved up through the hornblende slate, which was in consequence distorted and lifted up, as it is seen in the outskirts of the plateau, and in some of the low situations among the hills themselves, (the valley S. and close to Kotagherry;) we must also conclude, that the decomposition of the rock forming the red earth, and the detritus, must have happened at a period anterior to the existence of organic bodies; no remains of which have hitherto been found in them.

Specimens from the Northern Circars.

The specimens (from No. II. to No. IX.) are from the hillock near Puddapungalí; a place not far from Yornagorium, and about five miles from, and south of, Rajahmundry.

After traversing the alluvial plains of Ellore, the road passes near a knoll, the rocks of which are very interesting in a geological point of view.

Before reaching the foot of the little knoll in the plain, and in the nullahs, are seen numerous pieces and blocks of a hard whitish limestone, spotted in many places with numerous small black specks. This limestone is compact, the fracture glimmering on account of the many grains of calcspar which enter into its composition.

In the deep nullahs, in the plain, and at the foot of the hillock along the road, we see a conglomerate sandstone, which appears to be the lowest visible rock in this place. Ascending the gentle slope of the knoll, we come upon many masses of wacke, which is decomposing in thick concentric layers. Proceeding a little higher we meet with a thick bed of limestone, similar to the pieces scattered about on the plain.

This limestone abounds with fossil shells, which are clearly and better defined in the upper than in the lower portion of it, where the rock assumes a tufaceous consistence, friable, and almost approaching the appearance of tertiary limestone. The shells are very numerous in this upper stratum; almost the whole rock results from their assemblage; they appear to be chiefly bivalves, with a few univalves. Many of the shells have disappeared, their impressions only remaining; but the oysters which abound in this stratum are in excellent preservation, and easily characterized.

This stratum of limestone, the basset of which is only visible in

the slope of the hillock, has a W. and E. direction. It is overlaid by a thick mass of basalt, which caps the whole hillock. In some places, where this basalt lies immediately over the wacke, this last is converted into jasper. Huge masses of basalt are strewed on the top of the knoll, which forms a kind of table-land extending eastward: some of these blocks in their upper surface assume an amygdaloid structure, the cavities being filled with calcspar.

I could not in that locality see whether the lower compact limestone was or was not stratified. The more superficial and loose blocks, scattered about on the soil, had no appearance of stratification.

Judging from the appearance of the whole of those hillocks which stretch from N. W. to S. E. in the neighbourhood, they seem to have the same geological features as the one just described. Indeed, my friend Colonel Cullen, with whom I was examining this knoll, told me, that in some of the neighbouring hills, the position of the limestone and of the basalt is seen more clearly, on account of the abruptness of some of their sides, and the deep ravines which intersect them in every direction, so shewing the order of superposition in the four rocks; which is the following: conglomerate red sandstone supporting the wacke, overlaid by limestone, which is covered by basalt*.

The specimens marked X. and XI. are from the diamond mines at Mallavelly, near Ellore; they appear similar to the alluvial detritus in other localities in India, where this gem is found. The kankar accompanies the deposit in the same way as every where else.

No. XX. is the gneiss of which the hillock near the village of Carvera, close to Púndy, is found. In it the Cleavelandite replaces the laminar felspar, and is seen not only disseminated through the substance of the rock, but forming small strata by itself in long acicular crystals†. It is associated, in this rock, with a prodigious number of amorphous garnets, of which some of the strata appear entirely formed.

The porphyry, No. XII., is from the hills which form the northern boundary of the Garabunda pass, going from Kimidy, Garabunda, Cassibogah, to Púndy.

The hills to the south, and close to the pass itself, are sienitic granite, (No. XXXIII.;) while those beyond the porphyric hills to the N., towards the high hill of Mehendry, seem to be formed of that

* The trap near Sagur, described by Captain Franklin, appears to have the same association of rocks as the one of which I send specimens.—*Asiatic Researches, vol.* xviii. *Geology of a portion of Bundelkhand, &c., page* 30.

† Is this the Pindyray of the Telingas, mentioned by Doctor Heyne in his Tracts, page 283?

variety of gneiss abounding with albite, the continuation of which is seen N. and near Pundy.

These porphyric hills, therefore, may be considered as the out-goings of an enormous dyke of porphyry, which burst through the hills, having the same direction with them, that is N. E. to S. W.; their appearance is that of huge masses of a black looking unstratified rock; in many places completely divested of any sort of vegetation, particularly in those hillocks, which like the one called Chittakúnda, rise in abrupt, vertical cliffs, which seen within a moderate distance might be taken for basaltic rock.

The porphyry exfoliates in thick concentric laminæ, the more depending portions of which falling off, leave the upper in immense tabular masses, or cubic blocks, perched on the upper part, and sometimes on the declivity of the hill: this porphyry has a good deal of hornblende in its composition, sometimes so much, as to become hornblende prophyry.

In more than one of these masses of porphyry, I remarked thick veins or nests of a granitic rock, or rather gneiss, with pieces of sienitic granite imbedded in it. The crystals of felspar in this porphyry are well defined, many of them two or three inches long, and of a foliated structure. This porphyry seems, as I have said, to extend as far as near the sea-shore at Pundy. Some huge masses of it are seen jutting through the soil about a mile north of the village of Carvera, flanked by the gneiss containing ablite and garnets.

I have put up many specimens of laterite from different localities, by which may be clearly perceived the distinction between the *original* rock and the *conglomerate* bearing the same name; but which evidently arises from the conglutination of the detritus of the former. This appears to be the case with the laterite in some places of the plains of the Carnatic.

The specimens (No. XXIII. to XXVI.) are from the hillocks, on which the fort of Puddayaram (near Samalcottah) is built. The position of the visible rocks in this place is the following: the ferruginous sandstone is the lowermost, and has a great degree of compactness, so as to fit it for architectural purposes, in which it seems to be largely employed. It is evidently stratified, the strata being nearly horizontal; the quartz particles are agglutinated by a ferruginous cement.

The sandstone, nearly in the whole extent of the hillock, supports a lithomarge of a whitish or flesh colour, sometimes having a bluish tint. The stratum of this earth is not very thick, and in many places, it is overlaid by a purple-red, compact, slaty hæmatitic iron ore,

which passes insensibly in the upper part into a cellular rock, full of tubular sinuosities, very much similar to the laterite. In some places this ore lies immediately over the sandstone, without the intermediate lithomarge.

Before I finish speaking of the laterite in these low lands, I must mention an interesting fact I observed in the thick beds of laterite, which caps the hill on the foot of which Bimlipatam stands. In this place it overlies the garnetic gneiss so common all over this part of the country; and I was surprised to see a *large piece of the subjacent gneiss imbedded in the thick bed of laterite,* more than a foot above the point of contact of both rocks. This fact seems to countenance the inference of the detrital origin of the laterite of these plains and eminences. I am not aware that any pieces of extraneous rocks have been noticed as imbedded in the original laterite.

II.—*Notes of a Tour through Palestine.*

[We have been favored with the following extract from the private letter of a junior revenue officer in the Madras Civil Service, by the friend to whom it was addressed without any view to publication. This will be the excuse, if any such be required, for the cursive style in which it is written, to ourselves a strong recommendation in its favor.—Ed.]

Egypt is the most delightful country in the world to travel through; the boats (if previously ordered from Cairo) are the most comfortable conveyances imaginable. In all the great towns you get excellent leavened bread, and in every village, delicious milk, butter, eggs, fowls, and vegetables. I never lived so well in my life; and the weather was so cool and bracing, that I had a voracious appetite, and enjoyed all the good things. Barring the voyage up the Red Sea, (which except in the steamer is dreadful,) and the journey across the desert from Cosseir, (which is decidedly disagreeable,) I know no place so well calculated to re-establish the health of an Indian as the voyage down the Nile, between the months of October and April; but perhaps January and December are too cold for enjoyment.

My friend and myself left Cairo in the beginning of April, and travelled by land through El Arish, reaching Jerusalem in 14 days. This desert, though tedious, is not near so much so as that from Cosseir. Part of the way at first lies along the edge of the Delta through the cultivations, with plenty of water, and from El Arish, the road is delightful, through the finest pastoral country imaginable. From that place I have been pleased, more than I can tell you, with every thing I have seen in Syria, and have been agreeably disappointed in almost all my pre-

viously formed anticipations. I had always understood Palestine to be at present exactly the reverse of what it was in the time of the Jews—barren, waste, rocky, inhospitable. Most travellers describe it so; but this proceeds partly from the time of year at which it is visited, and partly from the difficulties of travelling compelling people to follow the same route. Travellers from India are generally too early. The seasons here are similar to those of Europe—the spring beginning in March, previous to which all is cold and uncomfortable. You know what a striking difference there is between the black plains of Nowlgoond, when covered with grain, and when bare, parched, and cracked after the harvest. So here, where the heats of summer are excessive, and burn up every thing, and the cold of winter is very severe, the country both looks and feels wretched previous to the approach of spring. We arrived in the middle of April, when every thing was green and smiling; perhaps a month earlier, certainly a fortnight, would have been better, to enable us to have avoided the present heats, which since the beginning of the month have not been exceeded by any I experienced in India, except perhaps when I was shooting lions at mid-day in Guzerat in the month of May. Then the usual route from Egypt is to land at Jaffa, and come through the rocky mountains of Ramlah, to Jerusalem; and thence, having seen the Dead Sea, to proceed by Nazareth to Burút, and sail thence; most of which is the worst part of Palestine. By coming by land, we saw first the beautiful plains of Philistia; and the greater security afforded by the Egyptian Government enabled us to visit with perfect ease the country beyond Jordan, and indeed to see every thing we could have desired.

To an up-country revenue man, the Holy Land must appear one of the most beautiful and productive countries in the world, presenting every capability for raising an enormous taxation, as compared with its size and extent; and this, as well as the numerous evidences of its former great population, presented every where in ruined towns, deserted cultivation, &c. perfectly explains the important part it played when the seat of the Jewish kingdom. The centre of the province presents a mass of limestone hills, running N. and S., bounded by plains backing to the sea-shore on the one hand, and by the valley of the Jordan on the other. These hills are horizontally stratified, and this natural formation, appearing like a succession of steps from the bases to the tops of the mountains, seems to have suggested to the inhabitants the mode of cultivation they have adopted, by improving and extending these natural terraces, and covering them with corn, but more generally with vineyards, fig-trees, and olive plantations. The

grey, broken stones, used in forming these ledges, contrast strangely with the rich products above them; and when the crops are off the ground, and the trees not in leaf, look exceedingly cold and barren. The hills are the richest portion of the land, and by far the best cultivated. The plains are equally capable; but the people are less independent, less able to protect themselves, and are therefore more indolent, careless, and miserable. These low lands are generally left as pasture: where cultivation is tried, it is of the most slovenly and dirty description; weeds and thistles choke the corn, and the fatness of the land vents itself in the production of the most beautiful and varied wild flowers. I saw many wheat-fields so full of scarlet anemones, wild tulips, poppies, blue corn-flowers, daisies, buttercups, and a hundred others, many of which I had never seen before, that they presented exactly the appearance of the richest Persian carpet, but a thousand times more beautiful. Both plains and hills are most abundantly supplied with water. Copious fountains gush out from every rising ground, with which our industrious Reddy and Lingayet ryots would convert the whole plain into one luxurious garden. No tanks, no wells, no boring machines are required here, but merely common intelligence and industry to guide and distribute the streams which God has so bounteously poured forth. Besides the plains of the coast, consisting of Philistia, that of Jaffa or Sharon, and those of Acre and Tripoli, there are inland, the plains of Esdrarlon and Galilee, between Samaria and Nazareth, and the Bekaa, the ancient Cœlosyria, between Libanus and Anti-Libanus, both of great extent, excellently watered, and of surprising fertility; but now grey with huge crops of enormous thistles, only occupied by tribes of wandering Bedowíns, with their flocks and herds and black tents.

In the land of the Philistines, we visited Gaza, a fine old town, where they point out the grave of Samson; the Muhammedans calling him *Nabbí Abd-ul Azíz*. We were inquiring from a Christian about Samson, of whom he had evidently never heard; demanding whether he was a Frank or what? when a green turbaned Musalman, passing by, gave us the desired information. We made out, to our perfect satisfaction, the place to which he carried the city gates, "on the hill over against Hebron." Thence we went to Ascalon, now completely in ruins, and deserted, but singularly well situated, being contained within a low abrupt range of hills, of about two miles in length, forming an arc round a portion of the sea coast, and terminating in the sea at either end. This ridge was crowned with enormous fortifications, the massive fragments of which, still remaining, attest the former strength of the place. Ashdod is also completely de-

stroyed, and the modern village of *Shadúd* is built under the mountain formed by the remains of the old city. At this place, (having first gone to the site of Ekron, and thus seen four of the five great lordships of the Philistines,) we turned out of the common and regular route, avoiding the barren and inhospitable journey from Ramlah to Jerusalem, and proceeded straight through the hills to Bethlehem, the country like the hills behind Dhárwár. I do not think any traveller ever took this road before; it is more direct, quite practicable, even for camels, which we rode, and is very beautiful. The hills are covered with flowers, with the green cistus and arbutus, the ilex, the little white flower called the Star of Bethlehem, and a great variety of others. Round Bethlehem are numerous fine vineyards, each with its "*tower*" and "*wine press*" in it; the round tower, like a cavalier bastion, being probably to guard the produce, and keep the tools, &c. Hence to Jerusalem is only five miles.

We remained in the Holy City, called here *Ul Kúds ul Sherif*, nearly three weeks. Part of the time we devoted to an excursion to Hebron, the Dead Sea, and Jericho. Hebron is one mass of terraced vineyards: the Muhammedan mosque, once a Christian church, covering the cave of Macpelah, may not be entered by Christian feet; but we went to Mamre, still recognizable in the name used by the Arabs Ramre, and pointed out by Jewish tradition as the spot where their father Abraham pitched his tent. It is not a plain: there are none in the centre of the hills; but four valleys meet here, and there is a fine supply of water, and it appears the Hebrew word rendered "Plain" may also be translated some kind of *trees*. The Dead Sea is the most dismal scene I ever beheld, and looks like a present, existing miracle; so extraordinary and different from every thing else in nature does it appear. There is no sign whatever of volcanic action in the hills around, by which its original formation has been explained. The air is always extremely hot and heavy, and indeed, we felt it most oppressive throughout the valley of the Jordan. At Jerusalem, and at midday, in the open air, going to Hebron, the thermometer was only from 58° to 65°, in the valley it was 96°. I bathed, as all travellers do, in the salt and pungent waters of the Dead Sea, in which it is impossible to sink; but I infinitely more enjoyed a swim of half a mile down Jordan, a small but deep and rapid stream: so much so, that the Israelites could never have crossed it without the miracle that divided its waters. The plain of Jericho is a fertile jungle, full of wild hog. It is watered by a fine stream flowing from the fountain of Elisha, now called *Ein-us-Sultán*, and might easily be rendered what it once was, the most fertile spot in Palestine, where only the balsam and

palm trees grew. *Ein-us-Sultán* is a beautiful spot, abounding with game, and flowing out of the ruins of Jericho, which are here, and not at the village of Rihhah, as generally said. It put me exactly in mind of the Diamond fountain described in the Crusaders, and must indeed have been the identical spot where Saladin and the Knight of the Leopard met; for it is directly in the way from Ascalon and Jerusalem to the wilderness of Engeddi, on the shores of the Dead Sea, whither, if I mistake not, the gallant knight was wending! It may be so with as much probability as the spot pointed out to us by the monks on our way back to Jerusalem, which they asserted to be the identical place where the traveller fell among thieves, and was relieved by the Good Samaritan in the parable—a mishap which actually occurred to your friend Sir Frederick Henniker, who was severely wounded and robbed here in 1818.

I was quite disgusted with the monkish legends at Jerusalem, assigning a locality to every act, however trivial, that is mentioned in Scripture; and also to many that are not mentioned at all. Here Peter heard the cock crow; here our Saviour fell when bearing the cross; here he rested his hand on the wall, and made a large hole in it; here the holy maid Saint somebody gave him a pocket handkerchief to wipe his brow. Then the whole locale of the Holy Sepulchre, Mount Calvary, &c. crowded within the space of one church, is a manifest and absurd fiction, and completely paralyzes all one's sensibility and enthusiasm. The gross superstition of the Christians here exceeds belief, and is only equalled by the hatred and animosity which the different sects, Greeks, Armenians, Latins, Copts, Maronites, entertain towards each other. This both explains and justifies the contempt with which the Turks treat them, and all other Franks, in consequence. As for the English, they say they have no religion at all, and both Catholics and Musalmans concur in calling them Deists and Atheists. Yet there are some excellent Protestant missionaries in the country, (particularly Mr. Nicolaysen at Jerusalem,) whose lives testify to the contrary. The Latin, that is the Roman Catholic, monks, of the Franciscan convent at Jerusalem, were guilty of a most abominable act about two years ago. An English traveller, Mr. Bradford, arrived at the convent very sick, and asked for the medicine, and the medical attendant of the convent. They refused, unless he would conform to the Roman Catholic faith: this he declined; but as he got worse, he said he would do any thing, only give him medicine. He died, and was buried in the Catholic burying-ground, with a fine Latin inscription, abounding in false concords, recording his conversion from the Protestant to the Roman creed! We were present at the

festival of the Greek Easter, (the old style,) when the Armenians, Greeks, and Copts perform the miracle of the Holy Fire, the grossest delusion ever practised by the priesthood on a superstitious laity. All Saturday evening and night, the church was full of Greek and Armenian pilgrims, running about the Holy Sepulchre in the most indecent manner, shouting, carrying each other on their shoulders, and every species of sky-larking. Two or three processions and some other mummery occurred at intervals during the night; and on Sunday forenoon, the Greek Patriarch and Armenian Bishop entered the Sepulchre, and very coolly poked a lighted candle through a little hole, declaring it to be the Holy Fire, just sent down from Heaven. All the pilgrims rushed to light their candles at it, the Armenians succeeding in doing so first. The crush was tremendous, and was followed by a melancholy catastrophe; for either the Greeks, jealous at the Armenians' getting away first, or from some other cause not known, a rush took place to the door, which had been locked since the preceding evening, and in the struggle numbers were trodden down and suffocated. We were trying to get out, unconscious of what was going on, and were nearly involved in the press. I cannot express the horror I felt when I found myself hurried *on* to a heap of dead and dying, from which I rushed back into the church. They reported to the Pasha 133 bodies carried out for burial; but there were many more not reported: the number must have exceeded 200. The number of pilgrims was greater this year than had ever been known; the Greek war and the conquest of Syria by the Egyptians having prevented the concourse of devotees for several years. Their number was estimated at 16,000. What made the circumstance more singular was, that on the Friday the Armenian Bishop, through the exertions, and indeed express stipulations of the principal people of the Armenian race, who are rapidly rising in intelligence, had intimated to the pilgrims, that the whole was a trick, and that it was to be discontinued after the present occasion.

There are however many interesting localities about Jerusalem, of which no one can doubt. Mount Sion and Moriah, the Temple Olivet, Valley of Hinnom, Bethany, all of which are very striking, particularly the very road by which our Saviour came triumphantly from Bethany to Jerusalem, where he wept over the city, and which can never be mistaken. I was deeply interested with this. The Mount of Olives is beautiful: you have a grand view of the city and of the Dead Sea from the summit.

We saw the Jewish Passover, and visited many of the principal Jewish families. They are an interesting race; many of them, fine venerable-

looking men. They present the appearance of every nation of Europe. The German Jewish are fair and blue-eyed; the Spaniards, olive and dark; the Moriscoes from Barbary, swarthy and burnt; the Polish different from all. All speak the languages of the countries to which they belong; they have no national feature or appearance like the English Jews. Many of the women were beautiful, and they alone, of all the women I have seen in the East, enjoyed the same consideration with the women of Europe, coming out to receive strangers, and joining in conversation with their husbands.

From Jerusalem, we went to Naploos, the ancient Samaria, through a very mountainous tract, full of terraced vineyards, and stood by the well where our Saviour talked with the woman of Samaria, between Mount Ebal and Gerizim; thence through the most lovely green valleys, each one with its little clear rivulet, to Sebaste, the capital of Herod, where John the Baptist was beheaded; and in two days more, across the plain of Esdraelon, watered by the brook Kishon, "that ancient river," where Deborah defeated Sisera, to Nazareth. There is nothing remarkable there, except the associations connected with a place where our Saviour resided for 30 years of his life, and over every part of which he must have trod. It is a pretty town among green hills. Here my companion fell sick, and we found, that though vaccinated, he had got the small-pox, probably from the pilgrims in the Church of the Holy Sepulchre. His attack being slight, I left him in the convent, and proceeded a 12-days' trip into the Haouran with two other travellers, the Honorable Mr. Curzon and Sir George Palmer. We passed Mount Tabor, Endor, Nain, and crossed the Jordan at Bethsan, from which we had a most beautiful march to Adjelún, and thence to Jorash, through a finely wooded hilly country that put me much in mind of some of the finest country about Kithúr, or a little more to the west of the Belgaum road, where the true forest begins: the trees were fine oaks and ilices, and game abounded. All this is comprehended under the general name of Gilead, more particularly it was the land of Og king of Bashan, still as famous for fine cattle as formerly. The castle of Adjeloon (see Joshua's miracle of the sun and moon standing still), is a grand object on the top of one of the highest hills, towering over all the wooded eminences around. The ruins of Jorash are very extensive and magnificent; a street of ruined Corinthian and Doric columns, nearly two miles long, two theatres, two temples, one with a grand portico in good preservation, and many other large ruins, attest its former magnificence. They were stately fellows, these Roman Governors. Here we found at their different towns of Bethsan (Scythopolis), Gerash, Ammon, Oomkais

(Gadara), all within two or three days' march of each other, forming the district called by the Romans the Decapolis, in each place one or two fine theatres, temples and great ruins, which proved how liberally the Roman Prætors were allowed to disburse the public money without sanction. Between Jorash and Ammon, we crossed the Zirkah, the ancient river Jabbok, entering the country of the Amorites, still hilly but destitute of wood; and then getting into the plain of Haouran, we skirted it to Oomkais, and lake Tiberias. This plain extends as far as the eye can reach, I believe even to Bagdad, and is tenanted by the Bedoweens only, of whom the Annesy tribe are found reaching nearly to the Gulph of Persia. There are a few villages near the Jebel Haouran, to one of which, named Bosra or Bostra, where there are also fine Roman ruins, we wanted to go, but could not, from want of water, and the excessive heat; and I was not sorry, for the plain of Haouran is not inviting. The fine part of Syria ends with the Decapolis. Tiberias is more interesting than beautiful—a fine clear, blue lake, about 16 miles long by eight broad, surrounded by bare rocky mountains, but it is interesting from being the scene of most of our Saviour's early miracles. It is always very hot here, as it is in the valley of the Jordan. The most remarkable feature about it is Mount Hermon, covered with eternal snow, rising over its (the lake's) northern side. It is the most remarkable mountain in Palestine, visible from almost every part, even from near Jaffa. Returning to Nazareth by Cana, I found my fellow-traveller quite recovered; but alarming reports being now prevalent of an insurrection having broken out against the Egyptian government, we deferred our plan of proceeding straight to Damascus, and turning westward to the sea coast we made the best of our way by Mount Carmel, Acre, Tyre, Sidon, to Bieroot. Here ascertaining that the commotion had not yet extended to Damascus, we crossed Lebanon and got there, visiting the Ameer Basheer in our way. The latter part of the road to Damascus was extremely dry and barren, the weather too was extremely hot. We therefore felt the full beauty of the situation of this city, for which it is chiefly remarkable, in the plain of the Haouran, watered by the river Banady, which irrigates innumerable gardens and orchards, and imparts an appearance of the richest verdure and fertility to the whole. The Damascenes have been obliged to relinquish their bigotted hostility towards the Franks since the rule of Muhammad Ali, and Christians may now ride into the gate, wear the white turban, and enjoy all the other privileges of Muhammadan subjects; nay, several of the chief persons showed us the interior of their houses, and one Abdullah Beg, son of Assad Pasha, who has the most magnificent establishment in the

place, even showed us his haram or the female apartments; but we are the first Franks who had been admitted to them. They are truly magnificent; realizing the descriptions of what one reads in the Arabian Nights. Spacious courts, with fountains and reservoirs and orange trees growing in the rooms all around, ornamented with arabesque painting and gilding, windows of painted glass, and luxurious divans. There is not a house that has not a fountain playing the whole day; but to this is attributed the unhealthiness of the city, which is extremely subject to fevers and agues; the density of the gardens, however, not a little contributing. The inhabitants give themselves up to continual enjoyment; they think of nothing but how to get most "*keef*," a word they continually use to express their indolent gratifications under the shade of their fruit trees, by the side of the numerous streams that flow through and round the town. All have a voluptuous and dissipated look, so that a Damascene can be recognized any where. I own I should not like to live there, nor to give myself to such an indolent Epicurean mode of existence, coupled as it is with continual fevers and visceral complaints. The bazars are very fine, and well but not grandly supplied. Ices abound, and iced water is hawked about the streets for even the poorest. We returned by way of Balbeck, the finest remnant of antiquity I have yet seen; add to which, the air is cool and salubrious, and the landscape around remarkably rich and beautiful. Mr. P—— and our other two friends finding it too hot, went straight back to Bieroot, and I alone took a detour by the cedars of Lebanon, crossing the highest summit of the mountain among the snow, to see the small and remarkable clump of trees, the only ones now remaining, and returned by way of Eden and Tripoli, to this place.

I have on the whole been delighted beyond my utmost expectations, and I think have seen every thing in the most satisfactory manner. The climate approaches so nearly to that of Europe, and so many of the natural productions are the same, that a thousand agreeable recollections are brought to the mind of a man who has been long from home, as we Indians have been, which afforded a pleasure I never dreamt of. Such were the feelings with which I first heard the cuckoo—such those with which I first trod on a bed of snow, and saw a flight of noisy jackdaws among the ruins of Jorash. The dog-roses, wild honeysuckles and brambles, the pine tree, and mountain ash, recalled many scenes of younger days in Scotland; while fields of wheat and barley, mixed with jowarree and chenna, the vine, the fig, the olive, the mulberry, gave to the whole a character peculiarly its own. Great quantities of silk are manufactured all along the north

part of the coast, the worms being fed on the large white mulberry, but they use the large wheel in winding it, and the fibre is much coarser and inferior to that of Dhárwár.

The Egyptians came to Syria under the most favorable circumstances. The people received them with open arms, and more than by the exertions of the invading army, promoted their success. The Pasha promised them a three years' exemption from taxes, and held out many other fair prospects. But he forgot to keep his word; nay more, he levied much heavier imposts than the officers of the Sultan had been wont to take: which from his greater military establishments, and the superior energy of his government, he was enabled to enforce. The miri or land tax of the Porte, is $\frac{1}{10}$ of the gross produce. All the land is therefore saleable, and the nobility and great men get a good rent, besides the tax, from their private estates. Very large estates belong to the crown, from the law that makes the Sultan heir to all his great officers, and to all who die without direct heirs; in which case the rent, in addition to the miri, goes to the exchequer. The Government dues are taken in three instalments or kists, and those due before harvest are realized through an intermediate agent, called the Soo-basha, generally one of the great landed proprietors or Turkish gentlemen, who is regularly recognised by the Government as the person through whom such payments are to be made. He then, exactly as happens in India, keeps a running account with the village, contriving that they shall always be considerably his debtors; and in recovering his advances, what with interest (18 per cent. per annum), gratuities, fees, &c. he contrives to make from 30 to 40 per cent. The Egyptian government now says to the rayahs, "we will release you from the Soo-bashas, we will take our 10 per cent. only, in one instalment at harvest, but, you must pay us also an additional sum, equal to the profits formerly made by the Soo-basha. The poor rayahs are forced to agree, and go on borrowing from the Soo-basha as much as ever. They were not ill off under the Porte, and now see their error, and bitterly repent the aid they lent to their more imperious tax-masters. Again, the Pasha has introduced lately his absurd system of monopolies, beginning with the silk, which he takes at a price, a very low one, fixed by himself, selling it again at a very enhanced one. I ascertained the prices of grain in Egypt, where the same system is in force. He takes $\frac{1}{5}$ of the produce of all rice lands in kind, and buys the *whole* remaining $\frac{4}{5}$ crops at 25 piastres the ardib or measure, shuts it up in his shoons or store-houses, and retails it for 75, at which price the very fellah who raised it is obliged to re-purchase it. In Syria this gave rise to increased discontent, and an attempt to enforce a military

conscription fanned these angry feelings into a blaze, and the whole of Palestine has been in open insurrection for the last five weeks. The mountainous country I have described as forming the centre of the province, is particularly favorable to undisciplined resistance ; the first detachments sent against them were cut off and dispersed. Reinforcements sent for to the camp at Jaffa were intercepted and destroyed, and Jerusalem itself was surprised. At last about 10 days ago, Ibrahi'm Pasha, the son of Muhammad Ali, and Commander-in-Chief, marched on Jerusalem from Jaffa with 7000 men. He was attacked in a narrow pass, was obliged to make a detour with a small escort to ensure his personal safety, (leaving his army to struggle through, which they did, losing more than half their numbers, and gained Jerusalem, which the peasantry wisely abandoned,) leaving his guns in possession of the rebels. Two of his field officers were so alarmed and astonished at this work, that they deserted their colors and fled by sea. Reinforcements have been demanded from Egypt, and so affairs stand at present, all eagerly desiring the return of the Sultan. Meantime a general fermentation exists throughout the land. A dangerous conspiracy was discovered, and quelled by sanguinary punishments at Aleppo. At Damascus, the conscription was so clumsily and stupidly enforced by troops surrounding certain quarters, taking out all sorts of men, whether of good condition or otherwise, violating the sanctity of harams to get at them, that numbers fled and joined the insurgents, and all the shops in the city were for some time closed. 600 poor wretches are shut up in the castle, whom they dare neither to release nor to embody in the ranks. A general feeling is manifested against the Christians, on account of the privileges to which they have been admitted ; and in several instances, the Muhammadans have shown a disposition to rise against them. There are a great number of Greeks, Armenians, &c. in all the large towns, generally people of some wealth. The people of Saphet two days ago arose and massacred the Jews. So that every thing looks like an impending storm, and I should not be surprised if it ended in the Pasha being turned out of Syria.

I have no feeling in favor of the Egyptian government. It is true they affect liberal opinions, protect the Franks, and imitate European improvements ; but the sole motive and object of all this is the Pasha's personal ambition, and its only good effects are a good police and a greater general security to person and property from all attacks—but those of the Pasha himself. Muhammad Ali, is certainly a wonderful man ; but he is, I am now convinced, perfectly selfish, and is not actuated in any way by a desire to ameliorate his country or people. I

was most unwilling to come to this conclusion, but the evidence is so positive I cannot help it. He has drained the population of Egypt, (which was 2,500,000) by continual conscriptions to keep up his regular army of 90,000 men, exclusive of some 20 or 30,000 for his fleet and arsenals, and of those he has seized to labor in his manufactories. So dreaded has this demand for men become, that the peasants now maim themselves to be exempted from service. In the whole of Upper Egypt, I could not find a single ryot who had not put out an eye, cut off a finger, or broken out a dozen teeth; even children of 10 and 12 years old are maimed. I speak soberly and in strict truth when I say, that during four days' sail down the Nile, I landed frequently, and took long walks, asking *every* individual I met, and I only found one not maimed, and he was born deaf and dumb! The aspect of the country is wretched; the villages are deserted and in ruins, much land lying waste, the people looking squalid, poor and miserable. The severity of the system was attested by the frequent insurrections that took place a few years back, but in the open valley of the Nile these were easily quelled. Meantime the Pasha, instead of husbanding his resources to enable himself, now that he has established his power, to reduce the burthens of his people, squanders away his revenue in absurd schemes. He forces the produce of *articles* with expensive purchased machinery, *which* he *could* buy cheaper from Europe in exchange for the natural products of Egypt. He engages in splendid projects, and seeks applause from the people of England and France. These mad enthusiasts, the Saint Simoniens, told him of the advantage of a rail-road across the Isthmus of Suez, and he is now surveying the ground for that purpose. He is trying to realize the splendid idea of Napoleon, of damming the two branches of the Nile, and irrigating the whole of the Delta; and with an almost childish impatience to complete his work, he drives the population of whole districts to the work, neither paying them nor providing them with food, in consequence of which many perish. Then he has sent 20,000 men to subdue Yemen, and to attack the Aseers, a wild tribe of Bedoweens, who will lead them into the desert, and probably destroy all the expensive materiel with which the Egyptian armies are most liberally furnished. Many of these schemes are worthy in themselves, but they are too great for the resources of the country, and the attempt to force them has given rise to a system of relentless tyranny, and reduced the people to a state of misery exceeding what I have ever seen or heard of elsewhere. The only thing I saw that gave me unmixed pleasure, was the Government school at Cairo, where about 900 boys are educated at the public expense, each boy receiving from 15 to 80 piastres a month, his food

and clothing. But there are not wanting who say, the Pasha only supports it to raise up for himself good officers; however, it is good in itself, and the results must be good, and I give him credit for it. I consider the principal points in his character to be ambition, and the vanity of appearing a great and enlightened prince in the eyes of Europe, and I think these will explain his whole policy. He has had the tact to win our representative, Colonel Campbell, completely to his interests, and the good Colonel is his warmest and most enthusiastic eulogist.

III.—*Characters of three New Species of Indian Fresh-water Bivalves, by* Isaac Lea; *with Notes by* W. H. Benson, *Esq.*

While our countrymen in India are hesitating to name or to describe as novelties their acquisitions in Natural History, under the apprehension of re-describing that which may be already known to the scientific world, our brethren of the United States are forestalling us, and are publishing in that distant land the acquisitions of their fellow citizens, made under the unfavorable circumstances which generally attach to cursory and hurried journeys through a country. It becomes us, then, to bestir ourselves, and not thus tamely to allow prizes to be carried off from our very doors, to swell the scientific triumphs of our transatlantic competitors.

The following descriptions of three species of *Unio* are taken from the 4th volume of the Transactions of the American Philosophical Society, in which work characteristic figures are given of each shell. The characters are from the pen of Mr. Isaac Lea, who has acquired perhaps a greater knowledge of the species of this genus, and has described more new ones than any other individual. Having during several years attended particularly to this department of Natural History, and taken numerous specimens of the shells procurable in the provinces, in which I have resided, I have ventured to add a few illustrative notes. Besides Mr. Lea's three species, and the well known *Unio marginalis* of Lamarck, I am acquainted with three other perfectly distinct species of *Unio* from the streams of the Bengal and Agra presidencies, which I propose to describe in a separate paper.—W. H. B.

Unio Cæruleus. Plate XIII. fig. 25. of Am. Phil. Trans. IV.

"*Testâ angusto-ellipticâ, transversâ, inæquilaterali, subcylindraceâ; valvulis tenuibus; natibus prominulis, rotundatis et undulatis; dentibus cardinalibus lamelliformibus, et in dextrâ valvula solâ duplicibus; lateralibus rectis; margaritâ cæruleo-albâ et iridescente.*

" Shell narrow-elliptical, transverse, inequilateral, subcylindrical; valves thin; beaks rather elevated, rounded and undulated; cardinal teeth lamelliform and double in the right valve only; lateral teeth straight; nacre bluish white, pearly and iridescent.

Hab. River Hoogly, Hindostan, G. W. Blakie.

Diam. ·6, Length ·8, Breadth 1·6 inches.

" Shell narrow-elliptical, transverse, subcylindrical, disposed to be straight on the sides and basal margin; substance of the shell thin; beaks near the anterior margin rounded, somewhat elevated, and corrugated with diverging undulations; ligament rather short and straight; epidermis finely wrinkled and bluish green, particularly on the posterior part; rays very indistinct; posterior slope furnished with small undulations and two irregular rays on each side; cardinal teeth lamelliform and double in the right valve only; lateral teeth straight and lamelliform; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices within the cavity of the beaks; cavity of the beaks wide and rounded; nacre bluish white, very pearly and iridescent.

" *Remarks.*—This species was brought from Calcutta by Mr. Blakie, to whose kindness I am indebted for it and many other fine shells. As far as I have been able to ascertain, it has not been described. From the roughness of the beaks it might perhaps be thought to be only a variety of *corrugata* (Lam.). On comparing the two species, however, they will be found to be entirely distinct; the *corrugata* being " ovato-rhombeâ," while the *cæruleus* is " angusto-ellipticâ." In some specimens the nacre is slightly rose-coloured along the basal margin."

Note.—This shell is extremely common in tanks in the vicinity of Calcutta, and is met with in profusion in the Ganges, Jumna, and their branches. The epidermis is ordinarily brown, and I have only met with the dark-green variety figured and described by Mr. Lea in jhíls in Bundelkhand. It varies much in diameter, being sometimes extremely ventricose, while another frequent variety is remarkable for the smallness of its diameter. All the varieties may be at once referred to this species, by attending to the generally polygonal outline of the posterior part of the shell, and to the rugæ on the beaks and slopes, which radiating in two different sets, form by this junction on the back of the shell, in fine specimens, a series of acute angles. The shallow variety above-mentioned, which has a paler green epidermis, and which is somewhat alate posteriorly, shews this character, in the greater perfection. The extreme varieties would be regarded as distinct species, if alone presented for examination; but I possess a beautiful series which connects them so gradually as to leave no doubt of their identity as a species. My largest specimen, which is an odd valve, is 1·95 inches in breadth. The nacre is occasionally tinged with salmon colour.—W. H. B.

Symphynota Bilineata. Plate XI. fig. 19, of ditto.

" *Testâ subelliptică, transversâ, inæquilaterali, compressâ ; valvulis tenuissimis ; posteriori margine dorsali elevatâ connatâque ; natibus subprominulis, undulas concentricas et duas lineas elevatas ad marginem posteriorem currentes, habentibus ; dentibus cardinalibus laminatis et in valvulâ dextrâ solum duplicibus ; lateralibus rectis ; margaritâ colore salmonis subtinctâ.*

" Shell subelliptical, transverse, inequilateral, compressed ; valves very thin ; posterior dorsal margin elevated and connate ; beaks very slightly elevated, concentrically undulate and possessing two elevated lines which pass to the posterior margin ; cardinal teeth lamelliform and double in the right valve only ; lateral teeth straight ; nacre slightly salmon coloured.

Hab. River Hoogly, Hindostan, G. W. Blakie.

Diam. ·3, Length ·7, Breadth 1·3 inches.

" Shell subelliptical, transverse, inequilateral, compressed, diaphanous ; substance of the shell extremely thin ; beaks very slightly elevated, concentrically undulated, possessing two small elevated lines which pass (posterior to the umbonial slope) to the posterior margin ; valves elevated into a carina and connate in the posterior dorsal margin : dorsal margin a right line ; ligament very small ; epidermis shining, greenish yellow, darker on the posterior slope ; cardinal teeth lamelliform and double in the *right* valve only ; lateral teeth lamelliform, long and straight ; posterior and anterior cicatrices both confluent ; dorsal cicatrices obsolete ; cavity of the beaks shallow, very wide, and exhibiting the undulations of the beaks ; nacre very thin and slightly salmon coloured, darker in the cavity of the beaks.

" *Remarks.*—This very small species was brought from Calcutta by Mr. Blakie, with the *U. cæruleus* (Nob.). Both were procured about one hundred miles above that city. It resembles, in its outward characters, the young of *S. cygnea* (*Anod. cygnea*, authors). It is, however, more transverse, and differs altogether in the formation of the hinge, which is furnished with perfect cardinal and lateral teeth. In the peculiar character of the *double tooth* in the *right* valve, it resembles the *S. ochracea**. The *bilineata* is easily distinguished by the two delicate lines which pass from the beaks to the posterior margin."

Note.—This species, which is tolerably abundant in the tank on the skirts of the southern glacis of Fort William, is an *Unio* to all intents and purposes. Mr. Lea's genus *Symphynota* is founded on an adventitious character which is incidental to most of the winged bivalves. It culls from various genera, such as *Unio* and *Anodon*, (already well separated on the best of all distinctive characters for bivalves, the difference of the teeth,) species, which otherwise agree with their respective genera, to unite them in one unnatural group. Mr. Lea's apology for its introduction, viz. the difficulty of defining

* See vol. iii. p. 455.

the boundaries of the genera of the *Naiadæ*, can hardly justify its adoption. The assumption that genera are separated in nature by an hiatus has been ably combated by the zoologists of our present English school. Genera melt into each other, and the circumstance of the flanking individuals of each cohort being in contact does not militate against their grouping round the standards which form their rallying points. Mr. Lea has named this shell from a character which exists only in young specimens, and which is also observable in a distinct and interesting species *(U. Theca*, Mihi), of which I possess an unique example from the river Cane in Bundelkhand. The largest specimen of *Unio bilineatus* in my possession, is in breadth, 2.3 inches. The adult shell has a brown epidermis inclining to fulvous towards the basal margin, and occasionally the anterior side inclines to form a wing as well as the posterior. Mr. Lea gives as a character, cardinal teeth " double in the right valve only;" but in every specimen which I possess, a thin lamina parallel with the principal lobe of the cardinal tooth, is more or less developed in the left valve, and interlocks with those on the right; and it is this double lamina in the left valve which forms one of the most valuable distinctions between the adult *bilineatus* and the occasionally symphynotous young of *Unio marginalis*, which has no trace of a double lamina in the left valves. The concentric undulations, on the beaks, which are also observable in the young of *U. marginalis*, also disappear in the adult *bilineatus*.—W. H. B.

Unio Olivarius. Plate XVI. fig. 38, of ditto.

" *Testâ ovatâ, transversâ inflatâ, pellucidâ; valvulis pertenuibus; natibus prominulis; epidermide pertenui, lævi et olivæ colorem habente; dentibus cardinalibus magnis laminatis erectisque lateralibus laminatis brevibusque; margaritâ pertenui albâque.*

" Shell ovate, transverse, inflated, pellucid; valves very thin; beaks slightly elevated; epidermis olive, very thin and smooth. Cardinal teeth large, erect and lamelliform; lateral teeth short and lamelliform; nacre very thin, white and pearly.

Hab. Burrill river, India, Dr. Burrough.

Diam. ·7, Length ·8, Breadth 1·5 inches.

" Shell ovate, transverse, inequilateral, inflated, pellucid: substance of the shell very thin; beaks slightly elevated, rounded and devoid of undulations: ligament very small: epidermis olive, very thin and smooth: rays obscure, cardinal teeth large, erect and lamelliform; lateral teeth short and lamelliform: anterior cicatrices slightly confluent: posterior cicatrices confluent: dorsal cicatrices not perceptible; cavity of the beaks wide; nacre very thin and bluish white.

" *Remarks.*—This interesting little shell is from the fine collection made by Dr. Burrough, during his travels in India, and I am indebted to his

kindness for the specimen figured. It is a perfectly distinct species, and may easily be recognised by its form, its pellucidness, and its smooth olive-coloured epidermis. It somewhat resembles a young *Anodonta* on the exterior, but the elevated lamelliform te th easily distinguish it from that genus. Its resemblance to a Spanish olive is very striking."

Note.—This shell, which Lieutenant Hutton, (vol. iii. J. A. S.) refers with doubt to the young of *U. marginalis**, from which it is perfectly distinct, is abundant in the shallow pools left on the sands of the Jumna and Ganges after their periodical rise. I have never met with a larger specimen than that figured by Mr. Lea. The colour of the epidermis varies from a pale clear green to a pale brown.

In concluding these notes on Mr. Lea's interesting descriptions, I may observe, that the Asiatic Society is indebted to him for a series of American fresh-water shells, chiefly *Uniones*, of which a list was published in the J. A. S. vol. i. and for a copy of his Observations on the genus *Unio*, printed in 1829.—W. H. B.

IV.—*Description of the Bearded Vulture of the Himálaya.* By B. H. Hodgson, *Esq. Resident in Nipal.*

Ordo Raptores—Fam. Vulturidæ.

Genus *Gypaëtos.*

Rostrum rectum ; basi plumis setaceis antrorsum directis tectum ; suprà rotundatum ; mandibula inferior, basi fasciculo, plumis rigidis elongatisque ornata ; cera plumis tecta ; tarsi breves, plumosi.

Species—*Barbatus*, Lin.

Synonyma.—*Vultur barbatus, necnon barbarus*, Lin. *Vultur aureus*, Gesner. *Nisser or Golden Eagle*, Bruce. *Bearded Vulture*, Edwards. *Lammer Geyer* of the Swiss, Shaw. *Father Long-beard* of the Arabs of Egypt, Bruce. The Bearded Vulture of the Himálaya, so familiar a tenant of the western portion of these mountains, nor yet unknown to, though much less common in, the eastern or Nipalese division of them, seems to have escaped the research of Hardwicke, and of Gould's contributors. There is no delineation of it in either the Century of the latter, or in the Illustrations of the former gentleman. It has also escaped the active and enlightened inquiries of the Zoological Journal, notwithstanding the startling, and, I fancy, exaggerated, notice of it contained in Heber's popular narrative. On these grounds, I am induced to forward to the Asiatic Society a draw-

* Lieutenant Hutton asks if it can be the young of his *Unio*, No. 18, of which the specimens deposited in the Museum Asiatic Society are *U. marginalis*.—Lamarck.

ing and description of a very fine specimen killed in the Kheri pass, by my brother Lieut. W. Hodgson: those who have better opportunities than I have of describing the bird's average size and internal structure, from comparison of numerous fresh subjects, seeming, year after year, disposed to reject the task.

My specimen is apparently that of a mature bird; but its sex is unknown to me. It measures, from the tip of the bill to the end of the tail, three feet ten inches, and has a breadth between the tips of the wings, not less than seven and half feet. The bill to the gape is 4 inches: the tarsi are $3\frac{3}{4}$ inches: and the central toe and talon $4\frac{5}{8}$ inches. The dimensions are given, at length, at the close of this paper; meanwhile I proceed to notice the characters of the bird, and to depict his general appearance and plumage, premising, that (according to my information) his *manners* are decidedly more vulturine than aquiline. Ordinarily, he is met with in groups, or pairs, or singly, without marked distinction of habits in that respect. But the prospect of an abundant repast is sure to collect numbers of the species, too voraciously intent upon satisfying the cravings of an appetite dependent for its gratification upon contingencies, to admit of their betraying any of that shyness of man which the aquiline race invariably manifest. If the flesh pots be exposed at Simla, or Massuri, or elsewhere in the western hills, it becomes necessary to keep a good watch upon them, lest the Bearded Vulture steal a share of their contents; and the offals and carrion-carcases, freely abandoned to him by our European soldiery, and by the peasantry, he rushes to devour, almost heedless of the neighbourhood of human-kind. Such too in their manners are the Bearded Vultures or Gypaëti of Europe and of Africa, which I apprehend are specifically the same with our Asiatic type, due allowance being made for the occasional exaggeration and inaccuracy of describers, as well as for the remarkable variety of aspect which the species itself is apt to exhibit. Of the *lammer geyer* of the Alps, I have access to no particular description: but the detailed accounts of Bruce and of Edwards, relative to the African bird, cannot be carefully corrected by each other, and then applied to the Himálayan subject, without leaving a full conviction of the identity of the species. For instance, Bruce's assertion of the partial nudity of the head, must be amended by reference to Edward's statement, that it is covered with small, close plumes; or, must be accounted for by Bruce's own surmise, that the subject of his examination was under moult. Neither of their descriptions require any other allowance, in order to suit our bird; for differences in *colour* are too notoriously caused by sex, age,

health, and season, in most species of the Raptorial order, to warrant any nice distinction on that basis.

Edwards gives seven and half feet for the breadth, and three feet four inches for the length of the African variety of the Gypaëtos; whilst Bruce's measurements carry the size of it up to eight feet four inches of breadth, and four feet seven inches of length. My specimen of the Himálayan variety of this bird is intermediate between those two statements: but I have been assured by my brother and others, that mine is decidedly a small individual; and that, whilst no credit is due to Heber's statement of 26 feet between the wings, there can be little doubt that the Indian Gypaëtos frequently has ten feet expanse of wings, and probably, sometimes, even eleven. The general structure and aspect of the Himálayan variety of this species, by their compound character, made up of Eagle and of Vulture, indicate the excellence of Storr's generic title of Gypaëtos, or Vulture-Eagle. The bill and head have a distinctly vulturine cast; but the wings, tail, and feet are scarcely less decidedly aquiline; and, upon the whole, the general semblance partakes more of the eagle than of the vulture.

The bill's length is to that of the head as 4 to $2\frac{1}{4}$; its form is strictly vulturine, distinguished only by somewhat superior elongation, and by the considerably greater compression of the anterior part, or that beyond the cere; where the ridge is almost sharpened, and the sides (as nearly as may be) devoid of convexity. The cere is wanting, and is replaced by a large mass of bristles, originating with the lores and forehead, which bristles, being directed forwards, and closely applied to the bill, entirely conceal the cerous portion of it, as well as the apertures of the nares. The form and position of the nares agree very well with those of *Vultur Pondicerianus*: that is, they are opened *considerably*, and occupy a place much nearer the tip than the gape of the bill: but they are less vertically cleft than in *Pondicerianus*, and have a more anteal aspect. They are long ovate, obliquely transverse, opened forwards, and entirely hid by the bristly incumbent cere coverts.

Another and similar mass of setaceous hair, to that just spoken of, protects the base of the *lower* mandible of the bill, being implanted on its sides; and a third tuft originates on its inferior surface, where the horn ceases, in order to afford extensibility to the gullet.

The last or gular tuft, like the ceral, is directed forwards, extending to the tip of the mandible, and there ending in a fork. This last patch of bristles, (which gives its trivial name to the species,) is freer, or less applied to the bill, than the others are. Hairs, scarcely

less setaceous than those laid over the bill, are likewise directed *backwards* over the head, shading the brows in two narrow lines, which terminate near the occiput, and have a common origin with the cere-coverts. The head, lores, and throat are perfectly clad in short, soft, composed, narrow, and pointed plumes. These small feathers give place suddenly, at the hind part of the head, to others of the same lanceolate form, but of ample size and free set, which adorn the whole neck, above and below, and have considerable affinity to the vulturine ruff. The head is broad and flat crowned, but not so flat or so broad as in the vultures: the eye, like their's, mean and small. The wings are of vast amplitude, reaching to within five inches of the tip of a tail that is no less than 22 inches long. They are high-shouldered, but less strikingly so than in the vultures. The prime quills exceed the tertiaries by 6 inches: first remex $3\frac{1}{2}$ inches less; the 2nd, which is very little if at all inferior in length to the 3rd, and 4th, the longest of all. The outer vane of all these quills is not emarginated; but the inner is strongly so, remotely from their tips. Though there be no appearance of moult in my specimen, I suspect that the relation of the 2nd, 3rd, and 4th remiges, as above stated, can hardly be the permanent and characteristic one; which probably gives 4th quill longest. The tail is longer than in any aquiline or vulturine bird I know, and is much and regularly gradated on the sides, the extreme lateral feathers being six inches shorter than the central ones; I should call the tail, therefore, wedged.

The legs are very short, and less muscular than in the genus Vultur; tarsi low and completely plumed, as in the Golden Eagle: thigh coverts long, reaching, (if directed towards them,) to the bases of the toes. The toes and talons are of the aquiline type: the former of medial unequal length and thickness, and reticulated, with the outer toes connected to the centrals by a large basal membrane: the latter, or talons, larger, acuter, and more falcate, than in the vulture, and as much so as in most of the Falconidæ: the outer fore and hind talon largest and equal; the central, less considerably; and the inner, as much smaller again. The general colour of our specimen is dark brown above, and rusty below; but the whole upper part of the back, and the top of the ruff on its dorsal aspect, are nearly unmixed pale orange: the shafts of the wing and tail feathers are mostly white; and their vanes, as well as those of the wing-coverts, are irregularly varied (for the most part, internally) with yellowish marginal or central streaks. The entire ruff, except where it fringes the occiput, is saturate, unmixed, brown; and the throat is essentially the same, but paler, and touched, here and there, with yellow. The

head and cheeks are whitish for the most part: the ceral and gular bristles, and those over the brows, pure black, as also a moustache or stripe backwards from the gape: bill and talons seemingly horn-yellow; and toes leaden-blue.

Dimensions.

	feet.	*inch.*
Tip of bill to tip of tail,	3	10
Bill, length of,	0	4
Ditto basal height,	0	1¼
Ditto basal breadth,	0	2½
Expanse of wings,	7	6
Tarsus,	0	3¾
Central toe,	0	3½
Ditto talon,	0	1⅜

Sex unknown.

P. S. Since writing the above description, it has been suggested to me by Dr. Campbell, that I have overlooked an account of the Himálayan Vulture-Eagle, by Lieut. Hutton, in the 34th No. of the Journal. Adverting to that account, I find no reason to alter my own, or to retract the opinion therein stated, that the Indian Gypaëtos is merely a variety of the single known species, which is common to Europe, Africa, and Asia. Lieut. Hutton gives his bird the same length as mine nearly, or 3 feet 11 inches; but he makes the expanse of its wings 9 feet 6 inches. Is there not here some undue allowance for shrinking in his 'old and mutilated' specimen? The wings of his bird agree very closely with mine in respect to the relative size of the prime quills: but I still think that this point wants ascertainment, by reference to several mature specimens in known full plumage. Again, I would reiterate, that differences of colour are of no importance: my bird has no dark mark across the head.

V.—*Red-billed Erolia. By the same.*

[Regarding the present paper, it is our duty to bring forward the following facts. In November, 1829, Mr. Hodgson sent to the Asiatic Society (presented and acknowledged, in the Proceedings of January, 1830,) this description, and a coloured drawing of natural size of a Wader, which he called "the red-billed Erolia." It accompanied several other similar notices, which are published in the second part of the 18th volume of the Asiatic Researches. But by some accident, the Erolia seems to have been omitted and mislaid, nor can it be found among the papers handed over to ourselves, in 1831, by the late Mr. Calder, who had previously conducted the publication of the Physical Researches. The bird is a great curiosity, and has been very recently made known to the public

at home by Mr. Gould as his discovery, although it is evident, that Mr. Hodgson's description and drawing were produced two years before. Mr. Hodgson has only now had an opportunity of seeing the last volume of the Researches, which has prevented bis bringing the unfortunate omission to our notice at an earlier period.—Ed.]

Ordo Grallatores—Fam. Charadriadæ—Genus *Erolia*.—Species New red-billed Erolia.

As in the grallatorial order the Ibis links together the families of the Ardeidæ and of the Scolopacidæ, so that remarkable bird which I am now about to describe, admirably connects the latter family with that of the Charadriadæ. It constitutes besides a sort of central step in the long gradation, from the most typical to the most aberrant genera of the order of Waders—from those which have a great length of legs, as well as of bill, to those which are deficient in respect to the length of both. If to these interesting peculiarities belonging to our bird, we add that the genus has been but recently established, and that only one species is known, it will readily be allowed, our bird (which is moreover a new species) is entitled to a full and minute description.

Without objecting to the generic character, as established by Vieillot, I shall take the liberty to dilate it as follows:

Bill, long, slender, weak, but not soft; well arched; upper mandible, rounded at the base; grooved for $\frac{3}{4}$ths of its length; smooth and scarcely dilated or obtuse at its tip: lower mandible, rather shorter than the upper.

Nostrils, wide linear; placed in the membranous part of the groove of the bill, and near its base; shaded above and behind by the membrane; open. Face entirely clothed with feathers. Legs rather short, and having but little of the thighs denuded. Feet cursorial. Toes three, short; the outer connected with the central by a crescented membrane as far as the first joint: inner scarcely connected at tbe base; margins of the toes with the skin subdilated; nails short, obtuse, rounded.

Wings elongated, but not acuminated; longest flags nearly equal to greatest quills; first quill longest*. Tail shortest; even; 12 feathers. In further illustration of the characters of this bird, I may add, that the bill bears the strictest essential resemblance to that of the Curlew, scarcely differing from it at all, being rather more pointed or less obtuse at the tip, and somewhat more decidedly arched throughout. I speak thus from a comparison of the bills of three species of Curlew (which are now before me), with that of the bird in question:

* Since found to be a mistake, by comparison of all the specimens: but the first quill is not a *sixteenth* of an inch less than the second and third.—Note of 1835.

and had I not adverted to the generic character of the Curlew as stated in Shaw's Zoology, I should have conceived that the bill of our bird could not be more accurately characterised than by simply likening it to the Curlew's. Shaw, however, says, the Curlew's bill is long in the *superlative* degree, has its tip *dilated*, and the nostrils placed in a *short* groove.

Now I have only to say that of my three species, that emphatically called the long-billed is alone remarkable (considering what family these birds belong to) for length of bill; that all three have bills, which, without being quite so thick at the base as the Ibis' beak, have yet some thickness there, which grows gradually and uniformly less towards their tips; that their tips are scarce sensibly dilated; that their nostrils are placed in a groove which runs fully $\frac{3}{4}$ths of the length of the bill, although it is only towards the base or around the opening of the nostrils, that the sulcation is broad or membranous; and that lastly, all these peculiarities, which to my apprehension belong to the bill of the Curlew, belong likewise to that of the Erolia.

But for the decidedly Charadriadic character of its feet, not only its long slender bill, but its general appearance, figure, and manners would dispose us to range the Erolia with the family comprising the Curlew, Godwit, and Avocet; and indeed, embracing almost all the long feeble-billed Waders.

Few genera of the grallatorial order have legs so short or thighs so little naked as those of the Erolia: and in respect to the brevity of its toes and nails, still fewer even of the Charadriadic family of the order, and none I believe of the Scolopaceous family, match it. Its wings and tail have no peculiarity, and both are proportioned pretty much as in the Curlews, Avocets, and Godwits. The new species now before me (and which I propose should be called the red-billed) measures nearly one foot five inches from tip of bill to tip of tail, being in fact about the size and weight of the common Avocet. The particulars of its size, proportions, and weight are given in the sequel; meanwhile, I proceed to the description of its plumage. The whole of the head above and below, as far as the eyes, hind part likewise of the *crown* of the head, the chin and the throat, black, mixed with grey about the base of the bill; and the whole black space margined towards the body with white: rest of the body above, including the back parts of the head, the neck, wings, and tail, full ashy blue: great quills and false wing, dusky blue, and a large irregular bar of white across the wings: upper tail coverts, black, with an ashy powder: tail feathers, cross-barred with dusky, in the manner of the Curlews; and all the feathers, save the two centrals, largely tipped with black;

the outermost tail feathers on either side having its outer web of a white ground colour, instead of a blue one, like the rest of the tail feathers and body above. Passing now down the bird's inferior surface, we have the chin black and the neck blue, as on the superior surface at bottom of the neck or top of the breast; a broad gorget of black, confined on the side towards the neck with a narrower band of white: rest of the body on this surface and wings and tail coverts, pure white: quills on this surface, white towards their bases: iris and bill, rich deep crimson: legs and toes, clear bluish grey, with a strong but irregular purplish tinge.

Dimensions and weight as follows:

	feet.	*in.*
Tip of the bill to tip of tail,	1	4½
Length of bill (in a straight line),		3¾
Ditto tail,		4½
Ditto a wing,		9⅛
Expanse of wings,	2	5½
Length of tarsi,		2⅛
Ditto of central toe and nail,		1⅝

Weight, 9½ oz. av.

The only specimen I have been able to procure was shot on the banks of a sandy stream in the valley, in October last; and it was apparently a mere passenger here, like the vast majority of the grallatorial and ratatorial birds which visit us, and which make only a stage of our valley on their way from the plains of Tartary to those of India, and back again.

[It is with much reluctance that we have been compelled to insert these two notices, without the beautiful drawings that accompanied them: but the number of plates inserted in the Journal hitherto, has been so great as to involve considerable expence, and to do justice to the present specimens, large and richly coloured, would have entailed a heavy additional charge. We have however the less regret in omitting them, now that we are informed of Mr. Hodgson's intentions to publish the whole of his valuable illustrations of the Natural History of Nipal—a stupendous work, that will require to carry it through, as we feel sure its merits will command, the patronage of all cultivators and admirers of the Fauna of India, here and at home. Having had enquiries from several quarters as to the probable extent, and as to the contents, of Mr. Hodgson's proposed work, we have obtained from that Gentleman a Catalogue of the Drawings already sent home, to be put into the Publisher's hands, which shall be inserted, if possible, in the next No. of the Journal.—Ed.]

VI.—*Hints for the Preservation of Objects of Natural History. By* J. T. Pearson, *Esq. Curator As. Soc. Museum.*

Preparations of natural history have two great enemies: insects and damp. The latter requires great and constant attention to prevent: the former are combatted by what are called preservatives. The preservatives in common use are preparations of Corrosive Sublimate and Arsenic.

Of the former, a very good preparation is made by merely dissolving a certain proportion in spirits of wine. For common purposes, such as the preservation of the soles of the feet, or inside of the mouth of animals, a scruple of corrosive sublimate may be dissolved in one ounce of the spirit; but for the finer operations, where the colours of insects and feathers, &c. are concerned, two grains of corrosive sublimate to an ounce of spirit, will be strong enough: made of this strength, the solution dries without leaving a white crust of crystals on the specimen; while it will prevent the attacks of insects, and even mouldiness, if ordinary care be taken to keep the specimens dry.

Another preparation of corrosive sublimate and arsenic, together, is recommended for the preservation of insects. Its composition is as follows:

Take of arsenic in powder, one ounce.

Corrosive sublimate, one ounce.

Spirit of wine, three ounces.

Spirit Sal Ammoniac, or Spirit Ammonia, one ounce. Mix them well together, and keep them in a bottle, labelled "poison," for use.

But of all the preparations used for the preservation of the skins of animals, the arsenical soap, invented by Becœur of Mentz, is the most celebrated and most useful. It is made thus:

Take of Arsenic in powder, 2 lbs. White soap, 2 lbs. Salts of Tartar, 12 oz. Lime in powder, 4 oz. Camphor, 5 oz.

Cut the soap into thin slices, and melt it in a little water or spirit of wine over the fire; then add the salts of Tartar and the lime. Take the mixture off the fire, and add the arsenic, taking care to mix it well by trituration in a mortar, or other convenient vessel; and when nearly cold, mix in the camphor, previously reduced to powder by the help of spirit of wine. When thus made, keep the arsenical soap in a glazed earthen pot, or a wide-mouthed bottle, and when used, dilute it with water to the consistence of cream.

The principal materials for both the above preparations may be procured in every bazar in India.

Mammalia.

The parts of Mammalia, (or those animals which suckle their young,) which are at once the most interesting to the naturalist, and the most easily preserved by the unscientific contributor to a museum, are the skin, and the skeleton or bones. All parts, however, are very useful, though there is some difficulty, to a person not accustomed to dissection, in preparing them.

When an animal of but a small size has been procured, such as a mouse, bat, rat, or even a squirrel, hare, or porcupine, the best mode of sending it to a museum is by placing it in a glazed jar, a large, wide-mouthed bottle, or a small barrel, with a large bung, filled three parts full of spirit of wine, strong gin, very strong bazar arrack, or any other ardent spirit, though on account of their not coloring the specimen, these are the best. A small hole should be cut into the belly of the animal before it is put into the vessel, to allow of the spirit entering freely into the internal parts, to preserve them. When a sufficient number of specimens have been placed, a wooden tally should be affixed to it, with a number cut thus

| oXXV. | oXL. | referring to a book, in which all the peculiarities of age, sex, color of the eyes, form of the iris, if round or oval, height, length, size in general, locality, &c. should be carefully noted; close the vessel carefully with moistened bladder over the cork, or bung, and cement it all over with a composition of bees' wax, rosin, ruddle, and turpentine; or common bazar sealing-wax may be used in default of any thing better, melted with enough very finely powdered brick-dust, to make it set hard.

Bones. The skeletons or parts of skeletons of mammalia, birds, and reptiles require but little knowledge or trouble to prepare them. The animal, or such part of it, the bones of which it is intended to preserve, should be skinned, and as much of the flesh as can be readily cut off, should be removed. The bones are then to be placed in a convenient vessel, such as a barrel, for large specimens, and a jar, or even a bottle, for small ones; and water enough poured into it, to cover them well up from the air. Close the vessel, and leave it for a longer or shorter time, as may be necessary, for the complete maceration of the bones; till the remaining flesh and ligaments will strip off with such ease, that the pouring a stream of water from a height of four or five feet upon them, will be sufficient to remove them. When freed from flesh and ligaments, the bones should be put in the sunshine to dry; and when well dried, they may be at once articulated, or packed in cotton or saw-dust, to prevent their rubbing against one another and being injured by carriage; and in this case the sooner they are sent to their destination the better.

In macerating bones, it is necessary to take care that the water always covers them, otherwise they will become indelibly black. The flesh must never be scraped off, or the specimen may be injured.

In washing bones after maceration, care must be taken that those parts which have become loose are not lost. This is likely to happen with the incisor, or front teeth; and with those bones, which, in young animals especially, are united to the other parts by ligament and by cartilage or gristle. All such detached parts should be taken off, cleaned, and put bye in a small box or bottle, and labelled with the name of the animal of which they formed a part.

As this method is attended with some trouble, and cannot be followed by persons not stationary, and as it separates the bones too much from one another to allow of their being sent to a distance without risk of losing some of them, it may be as well to mention another: which, indeed, has been printed and circulated in a separate form, along with a few more hints of the same kind. In this process, skin the animal, and cut off all the flesh from the bones as clean as can be done, *without scraping* them. Separate the fore legs, with the shoulder blades, from the body, and the hind legs, by taking the thigh bone out of the socket at the hip. Cut off the head close, between it and the first joint of the neck; and allow it to remain in water for a few days, when the brain may be washed out by directing a stream of water from a *Ghisty's mussack*, or earthen pot, into the foramen magnum, or hole of the spine. When cleared of flesh, hang up the skeleton to dry in an airy place, but do not separate the bones from one another more than is mentioned above. And when dry, pack it up in cotton, tow, or saw-dust, in a strong box, for transmission.

Skins of Mammalia may be preserved by attending to the following directions. After the death of the animal, let it remain an hour or two in a cool airy place, to allow the blood to congeal. Then lay it upon its back, and make an incision in the skin from between the fore legs, along the abdomen, to half way between the navel and the vent. The hind legs are then pulled out gently, bending them at the knee or stifle joint, and cutting them out of the socket at the hip. Cut off the tail close to the rump, and draw out the body through the opening in the skin, as far as

the shoulders, which separate at the shoulder-joint, and continue to draw out the body; an cut through the neck as close as possible to the head, between its first joint and the skull. Next pull out the legs as far as the fetlocks, either by the hand alone, or, as in large animals may be necessary, by fastening a cord to the bone, and attaching it to a hook in the wall, or a cross-beam, and then pulling down the skin. When skinned, cut off all the flesh from the leg bones, smear them well over with arsenical soap, wrap them in a little cotton or tow, and return them into the skin.

The head is next to be skinned very carefully, as far as the corners of the mouth, taking the greatest care not to cut the eyelids when the eyes are come to, and not to separate the lips from the gums; and the ears must be cut off as close to the head as possible. If the eyelids are cut, and the lips separated from the bones of the jaws, the specimen never looks well when set up; and if the ears are not cut off as close as possible to the head, they appear shorter than they ought to be. Having so far skinned the head, it must be left hanging to the skin; the flesh must be carefully cut off as clean as possible, the eyes taken out of their sockets, and the brain picked out with a hooked wire, or flat stick, and pair of forceps, through the foramen magnum, or hole for the spinal marrow at the back of the skull.

The next process is to smear the whole inside of the skin well over with arsenical soap; taking care to put some also upon the bones, and joints of the legs, and inside the skull, sockets of the eyes, mouth and nose. The balls of the feet and toes should have an incision made into each, and be well stuffed with arsenical soap; and a little should be put upon every part of the body which is naked of hair.

If the skin is very fat, as is the case with almost all the water animals, especially those of the dolphin, porpoise, halicore, otter, seal, and other cetaceous and amphibious genera; the fat must be all removed, and the skin rubbed over with powdered chalk or whiting, before the arsenical soap is applied. A little chopped cotton or tow should next be placed inside the head, and along between the skin and bones of the legs, face, &c.; and just enough in the body of the animal, to keep the sides of the skin from sticking together. The operation is now completed, excepting the skinning and stuffing of the tail.

The skinning of the tail is sometimes a more difficult business than all the rest put together. The stump of the tail must be fastened to a strong string, or in large animals, a cord, and the string tied to a beam, or hook in the wall, so as to bring the tail about on a level with a man's elbows, so that he may have full power over it. Two sticks, with a square edge on each, but the edges not so sharp as to cut the skin, must be applied, one on each side of the tail, and tied so as to inclose the stump between them. They are then to be taken hold of on each side, and forced down the tail, separating the skin from the flesh and bones, as they descend. This process prevents the skin from being turned inside out; which it is well to avoid, for it is very difficult, and sometimes impossible to get it right again. The skin of the tail is to be well smeared inside with arsenical soap, and a very small quantity of tow, or a small rope may be introduced by means of a split rattan, to keep its sides apart.

When the skin is thus prepared, it must be put in a cool airy place to dry, and after a day or two, it may be set in the sunshine. In damp or wet weather, however, it is better to put it in the sun immediately after being prepared with arsenical soap, otherwise the epidermis or scarf skin is liable to come off, and bring the hair along with it.

Care must be taken that skins thus prepared are well dried; and they should be sent off to be set up, as soon after they are dry, as possible. If

kept for any length of time, they ought to be frequently sunned, and always kept in an airy place, instead of being, as is too often done, shut up in boxes. It is the notion that zoological specimens must be excluded from the air, that has given rise to another notion not less absurd, that they cannot be kept in India. The experience of some collectors is to the contrary. And any person may analogically test it, by observing whether paper, clothes, &c. are mildewed most, when shut up, or not.

When an animal has been skinned and stuffed as above, there are still many parts of the body that are valuable to the comparative anatomist and to the zoologist. The bones of many animals are very valuable, and those of new and rare species should always be preserved for examination. The internal parts also of such species should be put into spirit and kept: the parts most useful are, the thoracic and abdominal viscera, particularly the heart and stomach; the organs of generation, external and internal; and the trachea, tongue and larynx.

The importance of affixing tallies to every specimen, and making notes and memoranda concerning it, cannot be too much impressed upon the mind of the collector. Every collection derives additional value from its having a good catalogue attached to it; while without such a catalogue, the best preserved specimens are often quite useless in a scientific point of view. As before said, the age, sex, size, height, length, circumference, locality, manners, colour of the eyes, form of the iris, and, in short, every thing peculiar about the animal, should be noted with the greatest care.

Birds.

In birds the skinning process is still more easy than in mammalia; though, as feathers are not so readily cleaned as hair, greater care must be taken not to soil them.

Birds are best procured for the purposes of natural history, by the gun. Those caught either in nets or by bird-lime, or any other means, are generally more or less injured in their plumage. To prevent as far as possible the feathers being soiled by the blood, the shot, with which the gun is charged, should be as small as is compatible with the size of the bird to be brought down, and the quantity of powder should not exceed half the usual load; in short, just enough of both shot and powder should be employed to bring down the bird. If the bird is only wounded, it should be taken hold of firmly under the wings, when by squeezing the sides of the body together, it almost instantly dies. When dead, the feathers over the wound should be blown aside, and a pledget of fine cotton placed upon it, to absorb the blood as it oozes out. Another pledget should be placed on the vent, and a quantity, proportionate to the size of the bird, must be put into the mouth, to prevent the blood of the wounded internal parts from coming out of the throat. The bird is then to be carefully wrapped in a handkerchief, taken home, and hung in a cool place.

After being allowed to hang for three or four hours, to allow of the coagulation of the blood, the skinning process may begin. The bird is laid upon its back, with its head towards the left hand of the operator; the feathers are carefully laid aside, and an incision is made from the fore part of the chest above the merry-thought bone, along the breast and abdomen, to midway between the breast bone and the vent. The skin is carefully pushed aside with the handle of the scalpel, or the fingers and thumb of the operator, backwards over the shoulder-joint, or that joint where the wing joins the breast; an incision through that joint is then very carefully made, (taking the greatest care to avoid cutting the skin of the back,) so as to separate the wing from the body, and a similar process is gone through on the other side. After having proceeded thus far, it is necessary to introduce some cotton between the skin and the body of the bird, to prevent the feathers from being soiled; and in fat water birds, the parts should be well sprinkled with powdered chalk. The mouth is next to be opened, and a pair of scissors pushed back into it, so

far as to enable them to embrace each side of the neck, and cut the vertebræ or neck bones through as close as possible to the head. A hook is then introduced into the fore part of the incision on the breast, so as to catch hold of the neck; when the bone may be readily drawn out, without disturbing or injuring the feathers of the neck. A string is now to be fastened to the vertebræ of the neck, and the bird hung up to a hook in the wall, or any other convenient place, and the skin very carefully drawn off the back. It should be pushed rather than pulled, and with the fingers and thumb nails rather than with the knife. Indeed, the less the knife is used in skinning birds the better. Unless very great care is taken, the skin will here be torn; for on the back it is very tender, particularly so, indeed, in some of the hawks and pigeons. When the hip joints are come to, the thighs and legs must be pushed up, so as to allow of their being cut off at the joint next to the hip-joint, leaving what is generally thought to be the thigh, but which is, in reality, the leg, attached to the skin. The skinning then proceeds down to the rump, and the skin is finally separated by cutting through with a strong pair of scissors the rump bone in the middle, leaving at least half of that bone attached to the skin.

In cleaning the head, the tongue and trachea, or wind pipe, attached to it, must be drawn out; and the gullet or œsophagus also, if that part has not been previously removed by the withdrawal of the neck. A pair of sharp-pointed scissors must be run through the top of the inside of the mouth into the brain, first on one side the head and then on the other, so as to cut a triangular flap in the base of the skull. This flap is then to be detached by seizing and twisting it out with a pair of forceps, long and slender, like those in the common dressing case of a surgeon. The brain is then easily removed through this opening, by means of forceps; a bit of wire bent into a hook, and cotton wrapped round the end of the forceps into a ball to wipe it out. When the brain is removed, the eyes are to be taken out: and this is done by introducing from the mouth a hook formed like the hook found in the anatomist's dissecting case; by means of which, the eye is laid hold of and pulled inwards; taking care, at the same time, to detach it, by cutting the skin or folding of the outer coat of the eye, from its connections with the eyelid; and this must be managed carefully: for if the eyelid is torn, the head of the bird on that side never looks well when set up. The inside of the skull and eye-holes are to be well wiped out with dry cotton, and smeared with arsenical soap; after which, a pellet of cotton should be introduced into the eye-hole, and the eyelid closed accurately over it, so as to preserve the roundness of the part. A small quantity of cotton, dipped in arsenical soap, must also be put into the cavity of the head.

When the body has thus been removed from the skin, the wings are to be skinned as far as the first joint from the shoulder; and in a large bird, a little beyond. The flesh is to be removed from the bones of the wing, and the bones smeared over with arsenical paste, and covered with a small quantity of tow, dipped in the same substance. The legs are to be treated exactly in the same manner as the wings, skinning them as far as can be done without injuring the feathers.

When the bird is skinned, the skin must be smeared all over with arsenical soap, on the inside, especially about the rump and wings, where a good deal of flesh always remains. The inner side of the wings along that part of the bones not skinned, and the inner sides of the pinion, must have a small quantity of a solution of corrosive sublimate in spirits of wine, put upon them with a camel's hair pencil. For birds with a colourless plumage, it matters little of what strength this solution is made; but for those of the more delicate colours, two grains of the corrosive sublimate to one ounce of spirit will be enough; and this strength should not be exceeded, or the colours may be injured. A certain quantity of cotton is next to be put into the neck and body of the bird; the plumage

should be smoothed down ; a cone of paper, with the top cut off, to allow of the protrusion of the bill, is then made, and the bird put into it, and hung up to dry.

In the above process, there are some points in which the common rules of preserving the skins of birds are departed from in the following particulars: in the first place, the skinning process is different from that generally followed, in as much as the skin of the neck is never everted in this as it is in the common way, so that all the stretching of the skin and derangement of the feathers, which invariable accompany the other plan, are avoided ; and the inconvenience arising from which, in birds having large heads and slender necks, is very great: so much so, indeed, that in some birds, it is impossible to draw the head through the neck, and the making an incision, even, at the back of the head has been recommended. The rump is only half cut through, instead of being taken almost entirely out, whereby the feathers of the tail are faster and are carried better than they otherwise can be ; and if plenty of arsenical soap is used, no inconvenience follows from this. The wings are less deranged than in the common way; and by commencing to take off the skin from the fore part of the bird, there is less danger of damage to the feathers from blood, oozing from the inside, than if the hinder part is skinned first. By the eye too being taken out from the inside of the mouth, the feathers at the side of the head, which generally are of delicate colours and structure, are not so frequently injured as by their being removed through the eyelids. Upon this point it may likewise be remarked, that the eye may be left in altogether, if the cornea is touched with the before-mentioned solution of corrosive sublimate in spirit of wine: and when the specimen is dry, the eye may then readily be cut out, and a ball of wet cotton put in its place ; and the eyelid becoming soft, may be arranged as before.

Before a bird is skinned, it is well to notice several points that may be useful to the naturalist, as well as to the person who eventually stuffs and sets up the skin.

The colour of the eye should be noted down, taking care to define the shade as accurately as possible. The weight of the bird, its length, from tip of the bill and crown of the head, to the end of the middle toe, to the rump, and tip of the tail, should be taken ; as well as the expansion of the wings. If there are any naked parts about the base of the bill, or the head, their colour must be particularly noted, as the colour of these parts is apt to change, as will indeed sometimes that of the bill and legs: these latter therefore should be mentioned too. In short, every thing that strikes the observer as peculiar about the bird, should carefully be noted down.

Reptiles.

In the preservation of reptiles, no great trouble is required. When taken, every thing likely to interest the naturalist, or any future observer, it is well to record ; while their dimensions and weight should always be mentioned. They may be divided into three kinds for the purpose of this essay. 1st, Chelonian reptiles, or those having a hard covering, as the tortoises; 2nd, four-footed scaly-skinned reptiles, forming the Lacertan or lizard tribe; 3rd, the Batrachians, or frogs and toads ; 4th, Serpents.

Chelonian reptiles are best preserved, by carefully removing the inside by an incision made in the soft parts, by the side of the fore or hind legs ; though in some, particularly in large specimens, it is necessary to separate entirely the upper shell from the lower, cutting through the hard parts at the sides, before the inside can be removed. The less disturbance, however, of the shell, the better, and the less the bones are deranged, the greater the use of the specimen. When the inside, or so much of it as can well be got out, is removed, the shell should be smeared on the inside with preservative, and the outside may be brushed over with the corrosive sublimate solution. The brain of reptiles is very small, and enclosed in a hard long case ; and it matters not much if it is removed or not, as

enough of the preservative penetrates to that organ to prevent injury to the surrounding parts, if the mouth is well filled, and an iron rod or skewer employed to pierce the various parts of the head from the mouth. Some reptiles of this order have long necks; in them the neck may be skinned through an incision made in the lower part, where the neck joins the chest; but when the shell is removed, there is no difficulty in skinning the neck through the opening that is necessarily made.

Chelonian reptiles may be stuffed with cotton, like mammalia, for the purpose of conveying them from one place to another.

The larger lizards, crocodiles, alligators, &c. must be skinned and stuffed, and treated in all respects as mammalia. The smaller may be put into spirit.

Frogs are very difficult to deal with: they are hard to skin and stuff; and when done, the colours for the most part fade. In spirit, the colours fade also, but not so much, perhaps as when preserved dry, while the form is kept better.

Toads are generally of a sombre colour, and keep pretty well either stuffed or in spirit.

It is not an agreeable thing to stuff a toad. It is done by putting a sharp-pointed pair of scissors into his mouth, cutting through the spine, and drawing it, and the whole of the inside, out through the mouth. The thighs and fore-legs are to be separated from the rest of the skeleton, and replaced in the skin; or if time is allowed, the skeleton itself may be denuded of all the soft parts, and replaced in the skin: and the skin is then to be filled by the mouth with sand. The feet should be fastened down with pins to a bit of card or soft wood, and the preparation put to dry: when dry, a hole should be made in the belly, to let out the sand, and it should be varnished with some good hard, colorless varnish: copal perhaps is the best*.

Very large snakes may be stuffed as mammalia are, taking care, however, not to fill the skin so full as is generally done. The size of the artificial body should be as near possible that of the natural one. Small snakes should be kept in spirit of wine.

Fishes.

Fishes, if small, may be put into spirit of wine—if large, they must be skinned, very carefully, and stuffed. It is an easy way of stuffing fish, to make an incision along the side of the dorsal or back fin, laying the fish open from end to end. The back bone, and all the inside, is then to be taken out as close to the skin as may be, without cutting it; the arsenical soap is applied well over the inside, the incision sewed up, and the skin filled with sand by the mouth. When full, the mouth should be opened or shut, according to the position it is wished for it to remain in—a wire, twisted into a tripod at each end, is placed to support the fish, and allow it to dry; and when nearly dry, it must be varnished, with the same varnish as that recommended for reptiles; by which means, the colours are pretty well preserved. When the fish is quite dry, the sand must be poured out at the mouth, and the specimen is ready to be sent to its destination.

Crustacea.

Crustacea are found in various situations. Some are to be met with in the nets of the fisherman; some, as the sea crabs, may be caught by a line, baited with a muscle; others are found running about the sides of tanks, rivers, and shores of the sea; and others again, the parasitic crustacea, in various situations about the bodies of animals, especially on the gills of fish, or fixed on their bodies.

* Good copal varnish for this purpose is made by digesting powdered gum copal, without heat, for 48 hours, in spirit of turpentine: pouring off the clear turpentine, and allowing the varnish so made to evaporate in the sun to the proper consistence. By repeated digestions with turpentine, the whole of the copal may be dissolved, if pure; and the dissolution may be assisted by adding a little camphor to the turpentine, before pouring it upon the gum.

Crustaceous animals, such as crabs, lobsters, cray-fish, &c. may be all preserved in spirit of wine, but they generally lose their colours. Small ones may be dried as they are, but the larger specimens require to have the inside removed. Crabs are readily cleared, by taking off their shell, and drying it separated from the body, which has been previously freed from all the soft parts it contained. The corrosive sublimate solution is the best thing for the outside of crustacea, but arsenical paste should be smeared within. Great care is requisite to prevent crustacea being injured in drying, and they should be carefully packed in a good quantity of cotton, or the legs or antennæ will assuredly be broken.

Crustacea may be killed, if altogether breathers of water, merely by taking them out of that element. If partially or wholly livers upon the land, spirit of wine kills them readily enough. But care must be taken in handling some of them; for the crabs in particular make nothing of casting off a leg or two, with as much ease as a lizard does his tail.

INSECTS.

The class INSECTA contains a vast variety of animals. The mode of preserving them, however, is very much alike in all.

Insects are found in so many situations, that it is impossible to particularize more than a few. Upon and within vegetables living and dead; between the bark and the wood, and in the trunks and holes of trees; in the loose earth at their roots; under stones or logs of wood that have long been lying on the ground; at the roots of grass; between the leaves that grow close along the stem of some plants, as the plantain, sugar-cane, and many of the grasses; in bones and horns, both within their hollow cavities and in their substance itself. Dead carcases of animals and putrid animal matter of all kinds contain some very beautiful specimens: and some of the finest kinds are found in water, both stagnant and running; in short, it is more easy to tell where insects may not be found than where they may.

Insects that feed upon trees and high shrubs, may be caught by placing a table cloth beneath, and beating the branches with a pole; when the insects are shaken down upon the cloth, and easily seen. A white chattah answers the same purpose almost equally well with a table cloth, and is more convenient to carry; besides being serviceable in another way. They are easily taken in a net made of curtain gauze formed like a cabbage net, and fastened to a hoop at the end of a long stick. By making the handle of your net with joints like a fishing-rod, you are enabled to reach the higher branches. In using this net, which is well adapted for butter-flies, dragon-flies, bees, wasps, and other insects that are caught on the wing, a peculiar turn is given to bring the tail part of the net over the handle, doubling it on the rim; by which means the prey is prevented from escaping. Another net may be made to fold up, having two poles or handles on each side, made of bamboo, or other easily bending wood: these handles are straight until near the top, when they are bent off at nearly a right angle, and fastened together with a string, or two pieces of wire, looped together to form a hinge: the lower part of the side poles are fastened together at a proper distance, say two and a half or three feet, with a small cord, leaving enough of the lower ends, to form handles, by which to use the net. The whole is then to be covered with gauze, from the upper end down to the cord below, when the net is complete. To use it, little skill is required; one handle is taken in each hand, and it is held up open, against any insect it is wished to catch, and shut up by bringing the handles together quickly, when the insect is secured between the fold of the gauze. Large pincers with loops or rings, and with gauze between their loops, are also used; but the common nets, described above, are the best; and, indeed, all that are necessary. Coleopterous insects, or beetles; Hymeropterous, or wasps, bees, &c.; Hemipterous, or bugs, &c., and, indeed, all others, save the Neuroptera, or dragon-flies, and the Lepidoptera, or butter-flies, moths, &c. when caught, are to be put into a bottle containing a little spirit of

wine. But those which have any particular marks of delicate colours, and those whose colours depend upon a powder strewn over them, must not be placed in spirit, but alive into boxes; and it is best to put but one insect into each box. Butter-flies must be taken between the thumb and finger, and pressed at the sides of the thorax, just under the wings, when they almost immediately die. Dragon-flies may be killed in the same manner.

When the insects are brought home, those kept in the spirit should be taken out, and if of sombre colours, placed in a solution of corrosive sublimate for an hour or two, when they may be put upon pins, and made ready for preserving them. Those insects that cannot be placed in spirit, on account of their delicate colours, &c., should be taken out of the boxes, and put into a glass, or a wide-mouthed bottle, and the glass or bottle with the mouth closed may have a bit of camphor or a drop of æther, or a bit of carbonate of ammonia put into it, placed in a basin of hot-water, when they soon die. Prussic acid has been used for the same purpose, and its effects are said to be instantaneous: but its employment may be dangerous to the operator, if great care be not taken.

When an insect is dead, it should be smeared over the under surface with arsenical soap, or Latreille's preservative, the preparation of which has been given before; a pin, proportioned to its size, must be run, if a beetle, through the right elytrum or wing-case, and brought through the under side, between the second and third leg; and then it must be placed in a box or drawer. Other insects of all kinds should have the pin run through the thorax, or piece of the back, just in front of the elytra, and brought out between the legs below.

As a mere collector's cabinet, one convenient enough for the purpose may be made of any box; a French claret box, for instance, answers quite well enough, if provided with a close lid, to prevent ants and cockroaches from entering it, and fitted up with trays to run in grooves about $2\frac{1}{2}$ inches apart. The bottom of each tray must have a flat piece of solah well pressed; or a layer of cork, about $\frac{1}{3}$ of an inch thick, covered with paper, fastened on to it, will be better still, in which the pins, with the insects upon them, are to be stuck: or the top, bottom and sides of the box may be lined with solah or cork, so as to do without trays or drawers at all. Every fine day this box should be placed in the sun, to dry the specimens; taking care to keep the lid shut, that the light may not enter: for light destroys the more delicate colours of insects. With these precautions, insects may be kept for any length of time: for when once well prepared, the only thing requisite is to keep them dry.

Some very small insects cannot be run though with a pin. These should be placed upon a triangular piece of quill, cut into this form ▻, the sharpest angle being introduced into the insect at its underside, between two of the rings of the abdomen. A pin is then run through the broad end, and the whole stuck in to the box thus ⊳—. This is an improvement upon the plan hitherto recommended, of pasting the insect upon a triangular piece of card, inasmuch as it not only looks better, but it allows the under part of the insect to be seen, instead of hiding the characters of that part, which in some genera are very important.

Spiders are difficult to preserve, without their losing their plumpness and beautiful colours. Spirit of wine has been recommended, and when it is used, a good many may be put into a bottle together. If it is wished to preserve them dry, they may have the inside of the abdomen squeezed out, through a hole made in their under surface, and the cavity filled with very finely chopped cotton, or with sand; and then they may be pinned into the boxes. Latreille recommends that the abdomen be cut off from the thorax, stuck upon a stick, and introduced into a bottle, fastening the stick into the cork, so as not to touch the sides, and holding the bottle over a lamp or fire, till the specimen becomes dry, which is then stuck on the thorax again. Any of these plans will do with some of the

genera of spiders, tolerably, but none of them answer well. Caterpillars are in the same predicament as spiders, though a method of preserving them in all their beauty is said to have been discovered by Mr. Abbott, of Georgia, which seems to have been lost at his death.

Mollusca.

Those animals which, as their name imports, have soft bodies, and which, for the most part, are covered with a true shell, are divided into two kinds: those which inhabit the land, and those which live in the water. The latter are again divided into fresh and salt-water Mollusca; and a third portion seems to dwell in marshes, the estuaries of rivers, &c., forming an union, as it were, between the other two. The fresh-water Mollusca are found in tanks, running streams, and watery places of all kinds, either lying at the bottom, or floating in the midst, or attached to weeds, stones, and other extraneous substances. Salt-water shells are found in similar situations in the sea; some bury themselves in the sand, which is covered at high-water by the tide; while others may be found floating along upon the surface of the waves; and dead specimens lie scattered upon the shore. Marsh shells are to be met with in the estuaries of rivers and in wet places, whenever the salt-water mingles with the fresh.

The localities of land shells or snails, as they are generally called, are numerous. These shells are to be found upon the trunks and branches of trees, and lying or creeping beneath them; others are hidden under stones and pieces of timber, or weeds, or other vegetable matter. The best season to procure them is in the rains; and they are not found in abundance saving in moist places.

Having learnt the localities of the various kinds of shells, no great skill is needed to procure them. Land-shells may of course be picked up with the hand, and taken home in a box: fresh-water shells, by looking for them in their dwelling places, and by dredging them up by a net. Sea-shells are dredged up by nets, having a kind of strong rake attached to the front, to rake them from the bottom; when by continuing to draw on the net, the shells fall into it and are caught. Pelagian shells, those that swim upon the waves in the middle of the sea, are procured by a kind of small net, that is towed in the wake of a ship, or cast by a dexterous hand upon the floating animal from the deck. It is in the form of a cabbage net, about a foot and a half in diameter, with a rim round the top, made heavy with shot; and fitted with a long line, to allow of its being towed, or pulled in again after it has been thrown.

When procured, put the shells into boiling water, and boil them for a few minutes, to kill the animal; so that it may be removed in the spiral shells with a small hook, or a crooked pin: the animal of the bivalves may be taken out easily enough with the fingers, or a pair of forceps. But some of the very long spiral shells require to be left in water till the animal becomes so putrid that it may be washed out. The shell should then be cleaned with soap and water, dried, and kept in a box. In cleaning shells, great care must be taken not to break or injure their margins or mouths; and in land-shells, particularly, not to scrub off, or otherwise remove the epidermis, or skin-like substance that covers them.

Each kind of shell should have a box to itself; and the box must be numbered, or the number may be written upon the shell itself, if it is large enough to allow of that being done. The numbers should refer to memoranda of the locality, kind of animal, or any other interesting particular concerning the specimen, that may be known to the writer.

By carefully following these directions, a zoological collection may be made, that will, with tolerable care being taken of it, keep in any climate. The mounting, as it is called, or setting up the skins of birds and beasts, to look like the living animals, is another branch of the subject; and one that can be followed only by persons stationary, and with success, after long practice; but as it is the step, to which the foregoing instructions have been but preparatory, a few hints on that head will hereafter be given

VII.—*Proceedings of the Asiatic Society.*

Wednesday Evening, 2nd September, 1835.

The Honorable Sir Edward Ryan, President, in the Chair.

Mr. F. Corbyn, proposed at the last meeting, was balloted for, and duly elected a Member of the Society.

Messrs. H. Piddington, E. Dean, and C. Brownlow, proposed at the last meeting, were upon the favorable Report of the Committee of Papers, elected Associate Members.

The Secretary brought up and read the following Draft of a Memorial to the Honorable the Court of Directors, prepared by the Sub-Committee, nominated at the Meeting of the 1st July last.

"*To the Honorable the Chairman and Court of Directors of the East India Company.*

The Memorial and Humble
Petition of the Asiatic Society
of Calcutta,

Sheweth,

That the Asiatic Society, as your Honorable Court is aware, was instituted in the year 1784, for the purpose of "Enquiring into the History, Civil and Natural, the Antiquities, Arts, Sciences, and Literature of Asia."

That since its institution, its exertions have been continually directed to the above objects; that it has numbered amongst its members all the most distinguished students of Oriental Literature; and that it has succeeded in bringing to light many of the hidden stores of Asiatic learning, and in drawing and keeping alive the attention of your Governments in India, to the great importance and advantage of such researches.

That it was soon discovered, however, that mere individual efforts, or even the combined exertions of individuals, might, indeed, keep alive the spirit of inquiry, but could do little to diffuse amongst the people themselves, the knowledge of their ancient languages and literature, in which the whole of the legal and religious institutions of Hindusthan were embodied and preserved, and which, at the date of the introduction of British rule, were found in the exclusive possession of the priesthood, guarded with jealous monopoly as a means of influence and emolument, and doled out and interpreted to the uninitiated, as it suited their prejudices and interests. The public aid and encouragement of the existing Government was wanting to supply the resources formerly derived from the bounty of the native princes and nobles, which had shrunk in proportion as the British dominion advanced; and the necessity of it became at length so urgent, as to force itself upon the notice of the local authorities. Your Memorialists have only to refer to the recorded minute of the Right Honorable Lord Minto, Governor General, dated 6th March, 1811, a copy of which is annexed.

That the British legislature, upon the occasion of the renewal of the Charter Act of 1813, (53rd, George III. c. 55,) made an express provision, that "a sum of not less than one lakh of rupees, in each year, should be set apart, and applied to the revival and improvement of literature and the encouragement of the learned natives of India, and for the introduction and promotion of a knowledge of the sciences among the inhabitants of the British territories in India."

That in pursuance of the above enactment, the Supreme Government, accordingly, set apart the amount prescribed, which was appropriated, conjointly with sums previously granted by Government and other private endowments, partly towards the support or enlargement of the Sanscrit and Hindu Colleges of Calcutta and Benares; the Muhammedan Colleges of Calcutta and Delhi, the establishment of English Schools in these and other places; and partly towards the publication, as well of standard works, in the Sanscrit and Arabic languages, as of translations of English

works into those languages, a list of which is hereto also annexed, showing what works have been completed, and what are still unfinished. That this appropriation continued until the 7th of March, 1835, when, by an order of the Supreme Government, a copy of which is annexed, the whole of the works then in progress, and of which the particulars are therein given, were suspended, and the funds before devoted thereto, as well as those which should occur from the eventual reduction of the Sanscrit and Arabic Colleges, ordered to be employed exclusively, "in imparting to the native population a knowledge of English literature and science, through the medium of the English language."

That the Asiatic Society, considering the public and complete withdrawal of all support, from the funds of Government, to the revival of the ancient literature of the country, as a measure fatal to the objects and principles, the advancement of which they had so long been labouring to promote, were induced, by the urgency of the occasion, to make a humble representation to the Government upon the subject: but that their endeavours were ineffectual, as will appear by copy of the Memorial and answer also annexed.

That it is with regret and reluctance that your Memorialists are compelled for once to step beyond the immediate objects of their institution, and to become appellants to the liberality and justice of your Honorable Court.

That your Memorialists do not presume, for a moment, to question, either the discretionary power of the Supreme Government to apportion the Parliamentary grant in question, to such objects as to it shall appear the most deserving, or the soundness of the construction it has put upon the terms of the statute; still less is it their wish or intention to obstruct or depreciate the noble project of diffusing amongst the natives of India the knowledge of the language of their rulers, and thus enabling them, by their own efforts, to naturalize amongst themselves the arts and the sciences and the literature of Europe. But inasmuch as the entire subversion of the national language is a project neither contemplated nor possible, they humbly submit, that the diffusion of the English language is manifestly but one step towards the common end in view; that the study and improvement of the languages of the country is a step of at least equal importance, and that no means have been yet suggested so likely to forward that study and improvement, as the revival of the ancient languages and literature, the objects still of popular veneration—the source of all that is intellectual or valuable in the mixed dialects now in use, and the only model to recur to for their amendment or purification.

That, so long as the laws of the Hindus and Muhammedans shall continue to be the rule of judicial decision upon the rights of property, it is surely essential to the due administration of justice, to render the repositories of those laws generally accessible; so long as their religious system shall not be merely tolerated but protected, it is surely a matter of urgent consequence to facilitate the access, not of the people only, but of their rulers also, to the volumes that contain their tenets; and if the advancement of knowledge be regarded as the introduction to a purer faith, and higher tone of moral feeling, your Memorialists would urge, that no measure can be more effectual for the destruction of the sanctuaries of superstition, than that of rending the veil of mystery and ignorance, that has hitherto concealed its deformities.

That if the Governments of India had never stretched out a helping hand to foster and diffuse the knowledge of Asiatic literature, your native subjects might have regretted the apathy of their rulers, yet could not have complained, either of caprice or of abandonment. But thus to withdraw the support which it had for at any period afforded, appears to

be such a destruction of their hopes, as the experience of British rule had by no means prepared them for. And your Memorialists are well assured, that if your Honorable Court shall deem it inexpedient to alter that appropriation of the Parliamentary fund, which the local Government has determined upon, you will readily and cheerfully devise some other means of continuing that encouragement to the cause of Asiatic literature, which reflected honor on the hand that dispensed it.

Your Memorialists, therefore, humbly pray, that your Honorable Court will be pleased to continue the encouragement hitherto afforded to the revival of learning among its native subjects, and to direct that such reasonable sum may be supplied from the territorial revenues, as may be sufficient for promoting amongst the natives at large the study of the ancient language and literature of their country."

Resolved unanimously, that the Draft be approved and adopted, and the Memorial signed by the President, on the part of the Society, be transmitted without delay to the Honorable Court, through the local Government.

The Secretary reported the general opinion of the Committee of Papers, in favor of continuing the publication of the "Researches," in the quarto form, which was accordingly *Resolved*.

The report of the Committee of Papers on the proposition of the Catholic Bishop of Isoropolis, was submitted, as well as a letter from Government, declining to patronize the publication of his Cochin-Chinese and Latin Dictionary.

Resolved, that the Bishop be made acquainted with the unfortunate result of the application to Government; and with the great regret of the Society, at having of itself no means to undertake such a work: with an offer also, should it meet his wishes, to transmit the manuscripts home to the Royal Asiatic Society, of which the Oriental Translation Committee may probably be induced to undertake the publication.

The Secretary submitted the determination and arrangements of the Committee of Papers, in regard to the Oriental Publications made over by Government.

[The substance of these will be found in the Prospectus published with the July No.]

Library.

The following Books were presented.

Notes of Lectures delivered at the College Hall of Madras, by G. Noton, Esq., Advocate Genl. of Madras, on the system of Government and administration of Justice in India—*by Cavelly Venkata Laxmiah, through Kumar Radhacant Deb.*

Col. Beaufoy's Hydraulic and Nautical Experiments—*by his Son, the publisher.*

The Indian Journal of Medical Sciences, No. 21, for September—*by the Editor.*

Meteorological Register, for July, 1835—*by the Surveyor General.*

Hutchinson's Report on the Medical Management of the Native Jails throughout the territories subject to the Governments of Fort William and Agra—*by the Author.*

Museum.

A letter from H. Blundell, Esq. Commissioner at Arracan, presented for the Society's museum, a cast metal *Drum*, as a specimen of the skill of the rude and barbarous tribes on the northern frontier of the Moulmein district, called the Red Kayrens. An extract from Dr. Richardson's MS. journal of his mission to the Shan countries was read in explanation.

[This Journal should have been published long since; but it has been accidentally mislaid—we refrain from publishing the extract, in hopes of obtaining another copy of the whole.]

A letter from M. Des Noyers, of the Mauritius, acknowledging his election as an Honorary Member, and presenting a stuffed "Devil," *(Dasyurus Ursus,)* from New South Wales.

A letter from Lieutenant NEWBOLD, announced the despatch for presentation of a series of Geological Specimens of the Malay Peninsula.

The following mounted specimens were presented by M. BOUCHE':

1. *Loxia Oryzivora*, (the Ploceus Orvzivora of CUVIER.)
2. *Merops Viridis.*
3. *Columba Tigrina.*
4. *Muscicapa (?) Saularis.*
5. *Bucco Cyanops.*
6. *Bucco.*
7. *Oriolus Melanocephalus.*
8. *Brachypus Jacosus.*
9. *Pavo Cristatus.*
10. *Anastomus Coromandelianus.*
11. *Canis Familiaris Extrarius.*

Also a nest of the *Loxia (Ploceus) Philippinus.*

A live specimen of the *Python Amethystina*, was presented by P. CHIENE, Esq. 34th Regt. N. I.

Literary and Antiquities.

Read a letter from W. H. WATHEN, Esq. dated Bombay, June 1835, enclosing fac-similes of two ancient grants on copper, dug up in Gujerat, with an analysis of the form of Nágarí in which they are engraved, a translation, and a memoir on the subject.

[This valuable paper will appear in our next.]

A letter from C. NORRIS, Esq. Chief Secretary to the Bombay Government, forwarded copy of a Report on some inscriptions found at Hummum, on the Southern Coast of Arabia, by Assistant Surgeon HULTON, and Mr. SMITH of the Palinurus, while that vessel was employed under command of Captain HAINES, in negociating with the Sultán of Kishen, for the purchase of the Island of Socotra, and subsequently on the survey of the South Coast of Arabia.

[This paper will have early attention.]

A letter from G. W. TRAILL, Esq., Commissioner of Kemaon, forwarded copies of several inscriptions in unknown characters (ancient Nágarí), at *Bírahat* and *Gopeswar* in *Garhwál.*

A letter from M. RICHY, communicated a late discovery of a singular inscription on the passage leading to the theatre at Pompeii, of which an account has been lately published by M. DE CLARAC, Curator of Antiquities in the Louvre at Paris.

The inscription is as follows: AD XI K DECEMB. A XV, EPAPRA, ACVTUS, AVCTVS AD LOCVM DVXERVNT MVLIEREM TYCHEN ET PRETIVM IN SINGVLOS A. VIII M. MESSALA L. LENTVLO COS.

Without adverting to the shameless nature of the advertisement of the three freedmen, this inscription is deemed a curiosity from its containing a specific date (the only one found at Pompeii), and the name of two consuls, who had been the subject of controversy among antiquarians.

Casts of three gold coins of the Indo-Scythic King KADPHISES, were presented in the name of Colonel T. P. SMITH.

These highly curious coins were procured in the common bazar at Benáres, whither they were brought two years ago by a Marhatta pilgrim. The Greek inscription on all is most clear, BACIΛEVC OOKMO KAΔΦICHC, and the devices differ from all hitherto discovered. One of them represents the king in a Grecian war-chariot. We shall hasten to present our readers with an engraving of them.

The Secretary exhibited to the Members present, Colonel STACY's extensive collection of Indian coins, just arrived from the Upper Provinces.

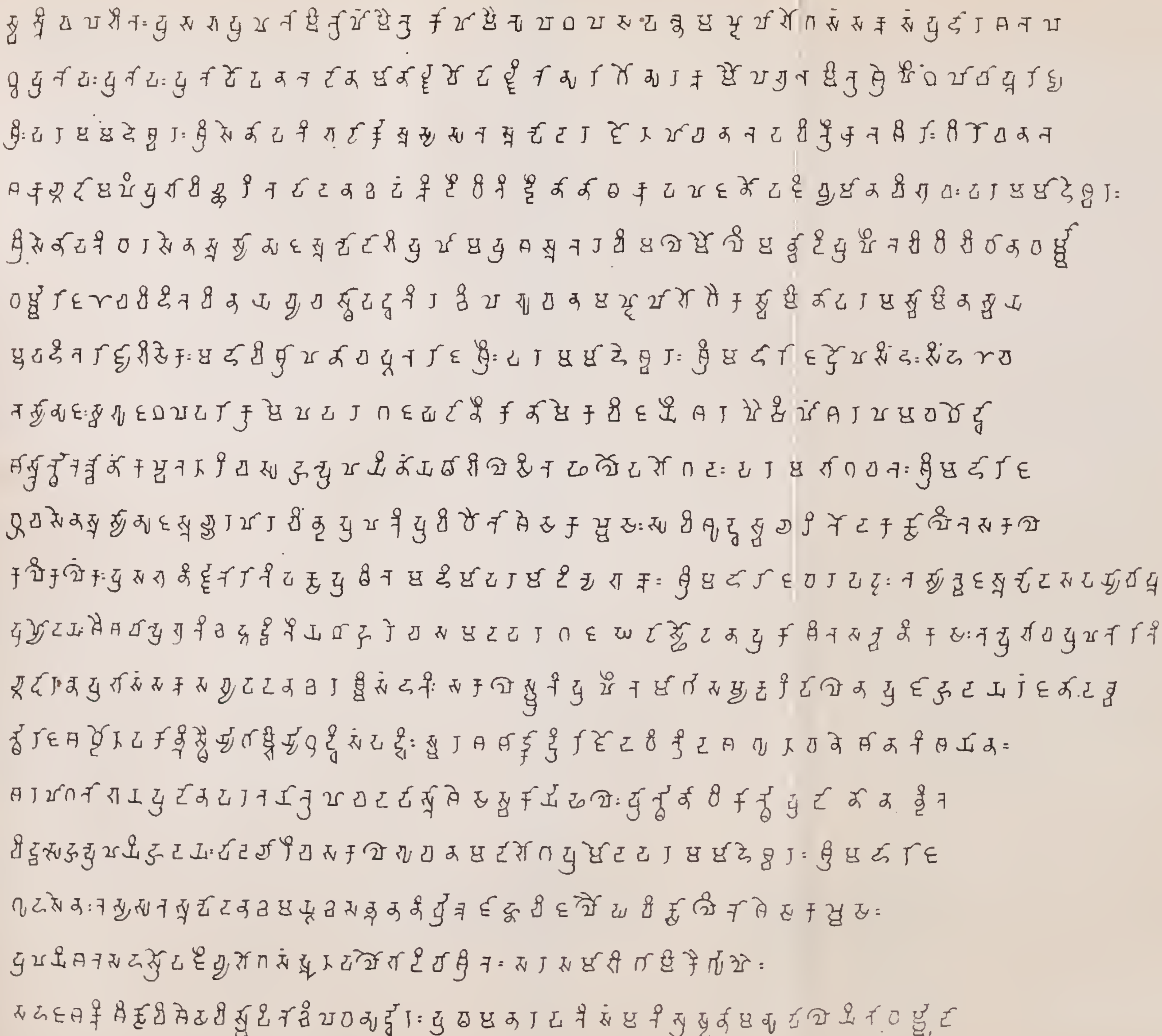
The series of ancient Hindu coins filling one cabinet is highly interesting, and more complete perhaps than any hitherto collected. Of the Canouj groupe, one coin attracted particular notice from its bearing in most legible characters the name of SAMUDRA GUPTA, the sovereign mentioned on the Allahabad *Láth*; but no where else that has hitherto been discovered. We propose immediately to glean some of the riches from Colonel STACY's labours, in illustration of our Indian Numismatics.

Meteorological Register, kept at the Assay Office, Calcutta, for the Month of August, 1835.

Day of the Month.	Observations at 10 A. M.							Observations at 4 P. M.							Register Thermometer Extremes.		Rain.	Wind.			Weather.		
	Standard Barometer, at 32°.	Wet Barometer, at 32°.	Aqs. Ten. deduced.	Thermometer in air.	Diff. or M. T. Depress.	Leslie's Dif. Hygrom.	Hair Hygrometer.	Standard Bar. at 32°.	Wet Bar. at 32°	Aqs. Ten. deduced.	Thermometer in air.	Diff. or M. T. Depress.	Leslie's Dif. Hygrom.	Hair Hygrometer.	Cold on roof.	Heat in sun.		Morning.	10 A. M.	4 P. M.	Day-light.	10 A. M.	4 P. M.
1	29,579	28,472	1,107	83,9	3,5	3,3	98,	,478	,280	1,198	86,0	4,4	4,5	98,	77,0	91,1		W.	sse.	se.	fair.	fine.	theatening.
2	,605			82,5	4,6			,538			82,5	4,6			74,8	93,6	,85	o.	w. nw.	w.	rain.	dull	rain.
3	,556	,474	1,082	83,2	3,8	3,5	98,	,488	,314	1,174	85,1	4,6	4,5	99,	76,3	91,8	,20	W.	se.	s.	cloudy.	overcast.	fine.
4	,628	,489	1,139	83,6	4,8	4,6	98,	,510	,296	1,224	86,4	5,1	5,6	98,	75,3	102,3		SW.	w.	S.	c. cirri.	fine.	do
5	,582	,406	1,176	85,3	3,5	3,7	97,	,497	,272	1,225	86,8	4,7	4,2	95,	79,3	105,0		w.	sw.	se.	do	do	hazy.
6	,569	,382	1,187	85,6	4,8	4,9	94,	,510	,322	1,184	87,0	6,0	5,7	94,	78,1	109,8		o.	sw.	sw.	do	do	hard rain.
7	,576	,380	1,196	86,2	2,9	3,0	97,	,466	,214	1,252	87,5	5,0	5,3	93,	77,8	110,2	1,25	o.	N E.	N E.	do	hazy.	showery.
8	,566			83,0	6,4			,487			84,5	5,9			77,4	95,2	1,00	W.	w.	W.	overcast.	cumuli.	fine.
9	,599			83,0	6,0			,523			83,5	2,7			75,7	89,1	1,00	o.	S.	S.	rain.	do	sett. rain.
10	,595	,422	1,174	85,4	4,4	3,5	96,	,519	,298	1,221	86,7	5,7	5,8	90,	76,2	92,6	,60	o.	sw.	sw.	cumuli.	do	fine.
11	,648	,461	1,187	85,9	4,4	4,2	94,	,541	,376	1,165	85,7	3,4	4,0	95,	76,4	100,0		se.	se.	N.	fine.	do	do
12	,664	,462	1,202	84,6	3,8	3,9	96,	,508	,322	1,186	85,6	3,9	4,1	95,	75,2	92,4		ne.	ne.	ne.	overcast.	do	showery.
13	,666	,460	1,206	84,7	3,0	3,1	97,	,522	,347	1,175	85,4	3,7	4,0	95,	75,7	89,2	,45	E.	se.	sc.	cumuli.	do	fine.
14	,692	,498	1,194	84,6	4,4	3,7	96,	,606	,424	1,182	84,5	4,6	4,0	95,	74,8	91,4	,20	se.	se.	SE.	do	cloudy.	do
15	,674	,497	1,177	84,1	3,0	3,0	98,	,614	,421	1,193	84,5	3,1	3,0	97,	76,3	87,0	,10	se.	se.	S.	overcast.	cum. str.	showers.
16	,686			79,0	5,0			,606			80,8	5,0			74,8	86,4	,65	S.	S.	S.	nimbi.	fine.	fine.
17	,737			81,6	7,3			,653			82,0	3,6			75,5	86,0	,50	E.	E.	e.	cumuli.	do	rain.
18	,746	,548	1,198	84,2	3,0	3,0	98,	,620	,396	1,224	85,1	4,2	4,6	95,	75,2	96,5	,30	E.	se.	s.	do	drizzle.	fine.
19	,704	,492	1,212	84,6	4,3	4,7	94,	,563	,246	1,323	87,7	7,4	6,8	90,	76,5	102,4	,05	s.	se.	sw.	fine.	fine.	do
20	,602	,348	1,254	86,1	4,0	4,5	94,	,528	,208	1,320	88,1	6,2	6,2	91,	77,7	105,4		e.	se.	se.	do	do	do
21	,684	,410	1,274	87,0	4,5	5,0	93,	,560	,278	1,282	87,4	3,9	4,1	94,	78,2	107,8		E.	se.	ne.	do	cloudy.	do
22	,682	,420	1,262	86,9	4,4	4,5	94,	,590	,230	1,360	88,1	5,8	5,3	94,	79,1	105,3	,60	E.	e.	sw.	do	do	overcast.
23	,598			84,0	7,6			,468			87,0				76,1	105,4		ne.	e.	ne.	do	fine.	do
24	,596	,297	1,299	86,5	4,6	4,7	94,	,493	,220	1,271	86,3	3,7	3,7	96,	78,3	94,6		E.	NE.	ne.	do	nimbi.	do
25	,532	,376	1,156	84,5	3,4	3,0	97,	,482	,336	1,146	84,3	3,2	2,9	97,	77,3	89,1	,20	ne.	ne.	se.	do	drizzle.	rain.
26	,676	,582	1,094	82,9	2,9	2,8	98,	,590	,445	1,145	84,1	3,6	3,3	96,	74,2	88,2	1,70	E	ne.	se.	rain.	sett. rain.	cloudy.
27	,706	,591	1,115	83,0	2,6	2,9	97,	,643	,516	1,127	82,6	3,1	2,6	98,	75,5	83,8		e.	ne.		sett. rain.	cloudy.	storm.
28	,676	,568	1,108	82,9	2,4	2,3	98,	,569	,423	1,086	82,7	2,2	2,3	98,	75,8	83,2	,25	sw.	sw.	SW.	cloudy.	drizzle.	do
29	,573	,497	1,076	82,0	2,0	2,0	99,	,490	,450	1,040	82,5	2,9	2,4	99,	75,7	90,6	,10	o.	sw.	o.	rain.	rain.	hard rain.
30	,478			80,7	3,0			,397			81.7	5,1			75,6	99,0	1,40	W.	W.	nw.	do	gathering.	gale.
31	,429	,270	1,159	83,5	1,6	1,9	99,	,323	,166	1,157	84,1	3,6	3,4	96,	77,2	100,8	,20	nw.	nw.	nw.	cumuli.		
Mean,	29,591	28,450	1,176	84,0	4,0	3,6	96,	1,529	,327	1,203	85,0	4,3	4,3	95,	76,4	95,3	11,60	South and east.			Seasonable weather.		

Instruments the same, and situated as usual.

Facsimile of Inscription in the ancient character



Facsimile of the Seal appended to the above antient Inscription

J.B. Fasson lith.

Alphabet of the antient character
with the corresponding letters in Devanagari Simple consonants

𑀓	क·	*k*	𑀤	ड·	*d*	𑀧	म·	*m*
𑀔	ख·	*kh*	𑀥	ढ·	*dh*	𑀨	य·	*y*
𑀕	ग·	*g*	𑀦	ण·	*n*	𑀩	र·	*r*
𑀖	घ·	*gh*	𑀢	त·	*t*	𑀪	ल·	*l*
𑀗	ङ··	*n*	𑀣	थ·	*th*	𑀫	व·	*v*
𑀘	च·	*ch*	𑀤	द·	*d*	𑀬	श·	*sh*
𑀙	छ·	*chh*	𑀥	ध·	*dh*	𑀭	ष·	*sh*
𑀚	ज·	*j*	𑀦	न·	*n*	𑀮	स·	*s*
𑀛	झ·	*jh*	𑀧	प·	*p*	𑀯	ह·	*h*
𑀜	ञ·	*ny*	𑀨	फ·	*ph*		ळ·	*l*
𑀝	ट·	*t*	𑀩	ब·	*b*	𑀰	क्ष·	*ksh*
𑀞	ठ·	*th*	𑀪	भ·	*bh*	𑀱	ज्ञ·	

Vowels *Initials*

𑀅	𑀆	𑀇	𑀈	𑀉	𑀊	𑀋	𑀌
a	*ā*	*i*	*ī*	*u*	*ū*	*ṛi*	*ṛī*
	𑀏	𑀐	𑀑	𑀒	𑀓	𑀔	
𑀍 *lṛi*	𑀎 *lṛī*	𑀎 *e*	𑀐 *ai*	𑀑 *o*	𑀒 *ou*	𑀓 *an*	𑀔 *ah*

Medials and Finals

𑀸	𑀹	𑀺	𑀻	𑀼	𑀽	𑀾	𑀿	𑁀	𑁁	=	=
𑀁	𑀂	𑀃	𑀄	𑀅	𑀆	𑀇	𑀈	𑀉	𑀊	÷	:

Compound Consonants

with and without vowels annexed